Panipat Institute of Engineering & Technology

An Autonomous Institution, Approved by A.I.C.T & Affiliated to Kurukshetra University, Kurukshetra
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Scheme of Studies and Examinations, and the Syllabi

for

Under Graduate Degree Programme

Bachelor of Computer Applications
(Cloud Technology and Information Security)

(in phased manner)

as per NEP-2020 guidelines

With Multiple Entry-Exit and Internship
w.e.f. Academic Session 2024-25

DEPARTMENT OF COMPUTER APPLICATIONS – UG

Bachelor of Computer Applications (CTIS): Approved in 2nd meeting of Academic Council held on 28.06.2025.

DEPARTMENT OF COMPUTER APPLICATIONS - UG

Vision of the Department

To be acknowledged as a center of excellence for academic eminence in developing competent, ethical, innovative, team-oriented Computer Application Professionals who can make a global impact on industry, environment, and the society at large.

Mission of the Department

M1: Equip students with knowledge and industry-oriented practical skills in Computer Applications.

M2: To provide a conducive environment for promoting research and innovation, imbibing ethics and values and instilling teamwork in students

M3: Foster analytical mindset, soft skills and competence in students to provide sustainable solutions for the real-life problems.

M4: Facilitate industrial and institutional linkages globally to provide experiential learning opportunities in emerging technologies.

Program Educational Objectives (PEOs)

The Graduate of the program will be able to:

PEO1: To exhibit analytical abilities practical and soft skills, competence, experiential learning and innovation.

PEO2: To demonstrate team work and supportive roles in agile work environment with ethics and values in their profession

PEO3: To excel in careers in the emerging technologies of computer applications, higher education and entrepreneurship.

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Program Outcomes (POs)

PO1	**Foundation Knowledge**	Apply knowledge of mathematics, programming logic and coding fundamentals for solution architecture and problem solving.
PO2	**Problem Analysis**	Identify, review, formulate and analyse problems for primarily focussing on customer requirements using critical thinking frameworks.
PO3	**Development of Solutions**	Design, develop and investigate problems with as an innovative approach for solutions incorporating ESG/SDG goals.
PO4	**Modern Tool Usage**	Select, adapt and apply modern computational tools such as development of algorithms with an understanding of the limitations including human biases.
PO5	**Individual and Teamwork**	Function and communicate effectively as an individual or a team leader in diverse and multidisciplinary groups. Use methodologies such as agile.
PO6	**Project Management and Finance**	Use the principles of project management such as scheduling, work breakdown structure and be conversant with the principles of Finance for profitable project management.
PO7	**Ethics**	Commit to professional ethics in managing software projects with financial aspects. Learn to use new technologies for cyber security and insulate customers from malware.
PO8	**Life-long learning**	Change management skills and the ability to learn, keep up with contemporary technologies and ways of working.

Program Specific Outcomes (PSOs)

PSO1: Ability to design and implement efficient and scalable cloud-based infrastructure software systems using state-of-the-art programming languages and tools.

PSO2: Ability to design, implement and manage secure software solutions using industry standards and best practices adhering to legal and ethical standards.

Scheme of Studies and Examinations (w.e.f. Session 2024 - 2025)
Bachelor of Computer Applications (CTIS) Semester – I

Course Code	Course Title	Period(s) L	T	P	Hours/ Week	Credit(s)	Continuous Internal Examination (CIE) Max	Semester End Examination (SEE) Max	Total Marks (CIE+SEE) Max	Duration of Exam (Hours)
Core Course (CC)										
BCA-101A	Foundations of Computer Science	3	0	0	3	3	40	60	100	3
BCA-103A	Digital Logic Design	3	0	0	3	3	40	60	100	3
ASH-MAT-115A	Basics of Mathematics-I	2	0	0	2	2	40	60	100	3
Value Added Course (VAC)										
BT-CE-104A	Environmental Studies	2	0	0	2	2	40	60	100	3
Skill Enhancement Course (SEC)										
BCA-105A	Problem Solving through C	3	0	0	3	3	40	60	100	3
Ability Enhancement Course (AEC)										
ASH-HUM-117A	English Language and Communication-1	2	0	0	2	2	40	60	100	3
Multi Disciplinary Course (MDC)										
BBA-215A	Digital Marketing	2	0	0	2	2	40	60	100	3
Practicum Course (PC)										
BCA-171A	Digital Logic Design Lab	0	0	4	4	2	50	50	100	3
BCA-173A	Problem Solving through C Lab	0	0	4	4	2	50	50	100	3
Total		17	0	8	25	21	380	520	900	

Scheme of Studies and Examinations (w.e.f. Session 2024 - 2025)
Bachelor of Computer Applications (CTIS) Semester – II

Course Code	Course Title	Period(s) L	T	P	Hours/ Week	Credit(s)	Continuous Internal Examination (CIE) Max	Semester End Examination (SEE) Max	Total Marks (CIE+SEE) Max	Duration of Exam (Hours)
Core Course (CC)										
BCA-102A	Operating System	3	0	0	3	3	40	60	100	3
BCA-112A	Data Structures using C++	3	0	0	3	3	40	60	100	3
BCA-114A	Introduction to Cloud Computing	2	0	0	2	2	40	60	100	3
ASH-MAT-116A	Basics of Mathematics-II	2	0	0	2	2	40	60	100	3
Value Added Course (VAC)										
ASH-HUM-107A	Universal Human Values	2	0	0	2	2	40	60	100	3
Skill Enhancement Course (SEC)										
BCA-106A	Introduction to Web Technology	3	0	0	3	3	40	60	100	3
Ability Enhancement Course (AEC)										
ASH-HUM-118A	English Language and Communication-2	2	0	0	2	2	40	60	100	3
Multi Disciplinary Course (MDC)										
ASH-HUM-119A	Indian Knowledge System	2	0	0	2	2	40	60	100	3
Practicum Course (PC)										
BCA-174A	Web Technology Lab	0	0	4	4	2	50	50	100	3
BCA-182A	Data Structures using C++ Lab	0	0	4	4	2	50	50	100	3
Total		19	0	8	27	23	420	580	1000	
Grand Total (Exit with 1 year Certificate)		36	0	16	52	48	900	1100	2000	

Note 1: The Industrial Internship shall be of 4 credits duration of 45-60 days after the 2nd semester. If a student takes exit after 2nd semester with **Under Graduate Certificate in Computer Applications (Cloud Technology and Information Security)**, marks of Industrial Internship shall be counted in 2nd semester itself.

Bachelor of Computer Applications (CTIS): Approved in 2ⁿᵈ meeting of Academic Council held on 28.06.2025.

Scheme of Studies and Examinations (w.e.f. Session 2024 - 2025)
Bachelor of Computer Applications (CTIS) Semester – III

Course Code	Course Title	Period(s) L	Period(s) T	Period(s) P	Hours/ Week	Credit (s)	Continuous Internal Examination (CIE) Max	Semester End Examination (SEE) Max	Total Marks (CIE+SEE) Max	Duration of Exam (Hours)
Core Course (CC)										
BCA-201A	Software Engineering	3	0	0	3	3	40	60	100	3
BCA-211A	Linux and Shell Programming	3	0	0	3	3	40	60	100	3
BCA-203A	Database Management System	3	0	0	3	3	40	60	100	3
BCA-213A	Introduction to Information Security	2	0	0	2	2	40	60	100	3
Skill Enhancement Course (SEC)										
BCA-215A	Full Stack Development-I (MERN)	3	0	0	3	3	40	60	100	3
Ability Enhancement Course (AEC)										
BBA-217A	Personality Development	2	0	0	2	2	40	60	100	3
Practicum Course (PC)										
BCA-281A	Linux and Shell Programming Lab	0	0	4	4	2	50	50	100	3
BCA-273A	Database Management System Lab	0	0	4	4	2	50	50	100	3
BCA-283A	Full Stack Development-I (MERN) Lab	0	0	4	4	2	50	50	100	3
	Total	16	0	12	28	22	390	510	900	

Scheme of Studies and Examinations (w.e.f. Session 2024 - 2025)
Bachelor of Computer Applications (CTIS) Semester – IV

Course Code	Course Title	Period(s) L	Period(s) T	Period(s) P	Hours/ Week	Credit (s)	Continuous Internal Examination (CIE) Max	Semester End Examination (SEE) Max	Total Marks (CIE+SEE) Max	Duration of Exam (Hours)
Core Course (CC)										
BCA-212A	Data Communication and Computer Networks	3	0	0	3	3	40	60	100	3
BCA-214A	Cyber Laws and Ethics	3	0	0	3	3	40	60	100	3
BCA-216A	Fundamental of Storage and Data Centres	3	0	0	3	3	40	60	100	3
Value Added Course (VAC)										
BCA-202A	Quantitative Aptitude	2	0	0	2	2	40	60	100	3
Skill Enhancement Course (SEC)										
BCA-218A	Full Stack Development-II (MEAN)	2	0	0	2	2	40	60	100	3
Discipline specific Elective Course (DSE)										
	Elective-I	3	0	0	3	3	40	60	100	3
Practicum Course (PC)										
BCA-282A	Storage and Data Centres Lab	0	0	4	4	2	50	50	100	3
BCA-284A	Full Stack Development-II (MEAN) Lab	0	0	4	4	2	50	50	100	3
	Elective-I Lab	0	0	4	4	2	50	50	100	3
	Total	16	0	12	28	22	390	510	900	
	Grand Total (Exit with 2 years Diploma)	68	0	40	108	92	1680	2120	3800	

Note 2: The Industrial Internship shall be of 4 credits duration of 45-60 days after the 4th semester. If a student takes exit after 4th semester with **Under Graduate Diploma in Computer Applications (Cloud Technology and Information Security)**, marks of Industrial Internship (either done after 2nd or 4th semester) shall be counted in 4th semester itself.

Bachelor of Computer Applications (CTIS): Approved in 2ⁿᵈ meeting of Academic Council held on 28.06.2025.

Scheme of Studies and Examinations (for the students admitted in the year 2024-25 and onwards)

Bachelor of Computer Applications (CTIS) Semester – V

Course Code	Course Title	Period(s)			Hours/ Week	Credit (s)	Continuous Internal Examination (CIE) Max	Semester End Examination (SEE) Max	Total Marks (CIE+SEE) Max	Duration of Exam (Hours)
		L	T	P						
Core Course (CC)										
BCA-311A	Principle of Virtualization	3	0	0	3	3	40	60	100	3
BCA-313A	Cloud Web Services	3	0	0	3	3	40	60	100	3
BCA-315A	Cryptography and Network Security	3	0	0	3	3	40	60	100	3
Discipline specific Elective Course (DSE)										
BCA-	Elective-II	3	0	0	3	3	40	60	100	3
Skill Enhancement Course (SEC)										
BCA-371A	Seminar	0	0	2	2	1	100	-	100	-
Practicum Course (PC)										
BCA-379A	Virtualization Lab	0	0	4	4	2	50	50	100	3
BCA-381A	Cloud Web Services Lab	0	0	4	4	2	50	50	100	3
Industrial Internship (INTR)										
BCA-377A	Industrial Internship	0	0	0	0	4	100	-	100	-
	Total	12	0	10	22	21	460	340	800	-

Note 3: If a student pursues 3 years UG Programme without taking Exit option, the Industrial Internship (either done after 2nd or 4th semester) will be taken into account in 5th semester.

Scheme of Studies and Examinations (for the students admitted in the year 2024-25 and onwards)

Bachelor of Computer Applications (CTIS) Semester – VI

Course Code	Course Title	Period(s)			Hours/ Week	Credit (s)	Continuous Internal Examination (CIE) Max	Semester End Examination (SEE) Max	Total Marks (CIE+SEE) Max	Duration of Exam (Hours)
		L	T	P						
Core Course (CC)										
BCA-312A	Network Administration	3	0	0	3	3	40	60	100	3
BCA-314A	Containerization using Docker Technology	3	0	0	3	3	40	60	100	3
Discipline specific Elective Course (DSE)										
BCA-	Elective-III	3	0	0	3	3	40	60	100	3
Skill Enhancement Course (SEC)										
BBA-318A	Entrepreneurship and Startup Skills	2	0	0	2	2	40	60	100	3
Practicum Course (PC)										
BCA-378A	Network Administration Lab	0	0	4	4	2	50	50	100	3
BCA-380A	Containerization using Docker Lab	0	0	4	4	2	50	50	100	3
BCA-376A	Minor Project	0	0	8	8	4	50	50	100	3
	Total	11	0	16	27	19	310	390	700	-
	Grand Total (Exit with 3 years Degree)	91	0	66	157	128	2350	2850	5200	-

Bachelor of Computer Applications (CTIS): Approved in 2nd meeting of Academic Council held on 28.06.2025.

Scheme of Studies and Examinations (w.e.f. Session 2024 - 2025)
Bachelor of Computer Applications (CTIS) Semester – VII (Honours)

Course Code	Course Title	Period(s) L	T	P	Hours/ Week	Credit (s)	Continuous Internal Examination (CIE) Max	Semester End Examination (SEE) Max	Total Marks (CIE+SEE) Max	Duration of Exam (Hours)
Honour Course (HC)										
BCA-451A	Design and Analysis of Algorithm	3	0	0	3	3	40	60	100	3
	Elective-IV	3	0	0	3	3	40	60	100	3
Value Added Course (VAC)										
BT-ME-112A	Design Thinking and Innovation	2	0	0	2	2	40	60	100	3
Practicum Course (PC)										
BCA-471A	Design and Analysis of Algorithm Lab	0	0	4	4	2	50	50	100	3
BCA-473A	Major Project-1	0	0	20	20	10	50	50	100	3
Total		8	0	24	32	20	220	280	500	

Scheme of Studies and Examinations (w.e.f. Session 2024 - 2025)
Bachelor of Computer Applications (CTIS) Semester – VIII (Honours)

Course Code	Course Title	Period(s) L	T	P	Hours/ Week	Credit (s)	Continuous Internal Examination (CIE) Max	Semester End Examination (SEE) Max	Total Marks (CIE+SEE) Max	Duration of Exam (Hours)
Honour Course (HC)										
BCA-454A	Server Administration	3	0	0	3	3	40	60	100	3
	Elective-V	3	0	0	3	3	40	60	100	3
Practicum Course (PC)										
BCA-482A	Server Administration Lab	0	0	4	4	2	50	50	100	3
BCA-474A	Major Project-2	0	0	20	20	10	50	50	100	3
Total		6	0	24	30	18	180	220	400	
Grand Total (4 years Honours Degree)		105	0	114	219	166	2750	3350	6100	

Bachelor of Computer Applications **(CTIS):** *Approved in 2ⁿᵈ meeting of Academic Council held on 28.06.2025.*

Scheme of Studies and Examinations (w.e.f. Session 2024 - 2025)											
Bachelor of Computer Applications (CTIS) Semester – VII (Honours with Research)											
Course Code	Course Title	Period(s)			Hours/ Week	Credit (s)	Continuous Internal Examination (CIE) Max	Semester End Examination (SEE) Max	Total Marks (CIE+SEE) Max	Duration of Exam (Hours)
		L	T	P						
Honour Course (HC)										
BCA-455A	Research Methodology	3	0	0	3	3	40	60	100	3
	Elective-IV	3	0	0	3	3	40	60	100	3
Value Added Course (VAC)										
BT-ME-112A	Design Thinking and Innovation	2	0	0	2	2	40	60	100	3
Practicum Course (PC)										
	Elective-IV Lab	0	0	4	4	2	50	50	100	3
BCA-473A	Major Project-1	0	0	20	20	10	50	50	100	3
Total		8	0	24	32	20	220	280	500	

Scheme of Studies and Examinations (w.e.f. Session 2024 - 2025)											
Bachelor of Computer Applications (CTIS) Semester – VIII (Honours with Research)											
Course Code	Course Title	Period(s)			Hours/ Week	Credit (s)	Continuous Internal Examination (CIE) Max	Semester End Examination (SEE) Max	Total Marks (CIE+SEE) Max	Duration of Exam (Hours)
		L	T	P						
Practicum Course (PC)										
BCA-476A	Dissertation	0	0	36	36	18	100	100	200	3
Total		0	0	36	36	18	100	100	200	
Grand Total (4 years Honours with Research Degree)		99	0	126	225	166	2670	3230	5900	

Abbreviations Used:

Abbreviation	Full Form	Description
CC	Core Course	Compulsory core course for the programme, CC will be a theory course of 3 credits
PC	Practicum Course	Compulsory practical course (software lab) of 2 credits
INTR	Industrial Internship	• A student can do Industrial Internship of 45-60 days duration after the 2nd or 4th semester. It will be of 4 credits. • If a student pursues 3 year UG Programme without taking Exit option, this internship (either done after 2nd or 4th semester) will be taken into account in 5th semester. • If a student takes Exit after 2 years in UG Programme, this internship (either done after 2nd or 4th semester) will be taken into account in 4th semester. • If a student takes Exit after 1 year in UG Programme, the mandatory internship done after 2nd semester will be taken into account in 2nd semester.
SEC	Skill Enhancement Course	These courses aim at imparting knowledge, practical skills, hands-on training and competencies, soft skills, etc. to enhance the employability of students.
AEC	Ability Enhancement Course	These courses aim at enabling the students to achieve competency in the English language with special emphasis on communication skills.
VAC	Value-Added Course	This course aims to instil in students (i) Universal Human Values, (ii) Environmental Studies (iii) Quantitative Aptitude.

Bachelor of Computer Applications (CTIS): Approved in 2nd meeting of Academic Council held on 28.06.2025.

MDC	**Multi-Disciplinary Course**	These courses are based on introductory knowledge in a subject which is different from the main discipline of study to gain knowledge across the disciplines. Students are not allowed to choose or repeat courses already undergone at the Senior Secondary Level (Class XII) or disciplines of study under this category. Provided further that if a Multidisciplinary Course (MDC) across the discipline cannot be offered by a Department/ Institute, due to its constraints and available resources, then i) A subject from the same discipline can be offered as a MDC course if that subject also belongs to the list of subjects of some other discipline. ii) MDC can be opted out of Massive Open Online Courses (MOOCs) from **NPTEL, SWAYAM**. It shall be of minimum 2 credits.
DSE	**Discipline-specific Elective Course**	A discipline-specific elective course is a course aimed at imparting options for varied knowledge and skills in the specialized fields of a discipline/subject.
HC	**Honour Course**	A honour course in the 4th year of the Honours or Honours with Research Degree Programme.

List of Discipline-specific Elective Courses

Elective–I (Semester-IV)	
BCA-256A	Essentials of Python
BCA-258A	Java Programming
Elective–I Lab (Semester-IV)	
BCA-286A	Essentials of Python Lab
BCA-288A	Java Programming Lab
Elective–II (Semester-V)	
BCA-355A	Foundations of Artificial Intelligence
BCA-357A	Internet of Things and its Applications
Elective–III (Semester-VI)	
BCA-356A	Blockchain Technology
BCA-358A	Web Security
Elective–IV (Semester-VII Honours/ Honours with Research)	
BCA-459A	Data Warehousing and Data Mining
BCA-461A	Quantum Computing
Elective–IV Lab (Semester-VII Honours with Research)	
BCA-481A	Data Warehousing and Data Mining Lab
BCA-483A	Quantum Computing Lab
Elective–V (Semester-VIII Honours)	
BCA-456A	Digital Forensic and Investigation
BCA-458A	Ethical Hacking

Note 4: Relative weightage of Continuous Internal Evaluation (CIE) and Semester End Examination (SEE), criteria of passing marks, evaluation procedure, and other guidelines are as per the Ordinance of Under Graduate Degree Programmes: Bachelor of Computer Applications, Bachelor of Computer Applications (Cloud Technology and Information Security), Bachelor of Computer Applications (Data Science).

Bachelor of Computer Applications (CTIS): Approved in 2nd meeting of Academic Council held on 28.06.2025.

Bachelor of Computer Applications
(Cloud Technology and Information Security)
Semester -I

Course Code	Course Title	L	T	P	Credits
BCA-101A	**Foundations of Computer Science** (Pre-requisite: None)	3	0	0	3
		CIE	SEE	Total	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-101A.1	Understand the fundamentals of computers, types of software, and memory hierarchy.
BCA-101A.2	Identify and explain the functions of I/O devices and basic components of operating systems.
BCA-101A.3	Demonstrate knowledge of internet concepts, email systems, and web browsing tools.
BCA-101A.4	Understand various computer threats and apply basic security and protection mechanisms.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-101A.1	3	2	-	2	-	-	-	2	3	1
BCA-101A.2	2	-	-	2	2	-	-	2	2	2
BCA-101A.3	2	2	2	3	2	-	-	3	2	3
BCA-101A.4	3	2	2	3	-	-	2	3	1	3

Course Contents:

UNIT-I   Contact Hours: 12

Basics of Computer, Software and Memory

Computer Fundamentals: Computer Evolution through Generations, Computer Characteristics, Computer Strengths and Limitations, Computer Classification, Computer System Components, Computer Applications in Various Fields.
Types of Software: System Software, Application Software, Utility Software, Shareware, Freeware, Firmware, Open Source Software.
Memory Systems: Bits, Bytes, Words, and Nibbles; Storage Locations and Addresses; Storage Capacity Measurement Units; Access Time; Memory Hierarchy. Primary Memory: RAM, ROM, PROM, EPROM. Secondary Memory: Storage Devices; Magnetic Tape, Hard Disk, Optical Disk, Flash Memory

UNIT-II   Contact Hours: 12

Input/ Output Devices and Operating System basics

I/O Devices: Desktop Computer I/O Ports, Device Controllers, Device Drivers. Input Devices: Types and Uses; Keyboard, Pointing Devices—Mouse, Touchpad, Trackball, Joystick, Magnetic Stripes, Scanner, Digital Camera, microphone. Output Devices: Speakers, Monitors, Printers—Types, Laser, Inkjet, Dot-Matrix, Plotters.
Introduction to Operating Systems: Definition, Functions, Features; Icons, Folders, Files; Start Button, Taskbar, Status Buttons, Shortcuts, Recycle Bin, Desktop, My Computer, My Documents, Windows Explorer, Control Panel.

UNIT-III   Contact Hours: 10

Internet and Electronic mail concepts

The Internet: Network and Internet Basics, History, Internet vs. Intranet vs. Extranet, How the Internet Works, Internet Connection Methods.
Electronic Mail: Overview, Pros and Cons, User IDs, Passwords, Email Addresses, Message Components, Composition, Mailer Features. Web Browsing: Browsers and Search Engines.

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UNIT-IV   **Contact Hours: 11**

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Threats and Security fundamentals

Threats: Physical and Non-Physical Threats, Viruses, Worms, Trojans, Spyware, Keyloggers, Rootkits, Adware, Cookies, Phishing, Hacking, Cracking.
Computer Security Fundamentals: Confidentiality, Integrity, Authentication, Non-Repudiation, Security Mechanisms, Security Awareness, Security Policies, Anti-Virus Software and Firewalls, Backup and Recovery.

Text Books:
1. Sinha, P. K. & Sinha, Priti, *Computer Fundamentals*, BPB
2. Dromey, R.G., *How to Solve it By Computer*, PHI

Other References:

1. Balagurusamy E, *Computing Fundamentals and C Programming*, Tata McGraw Hill.
2. Norton, Peter, *Introduction to Computer*, McGraw-Hill

NOTE:
1. For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 5-7 short answer type questions, will be compulsory and based on the entire syllabus. Rest of the eight questions is to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit AND Question no. 1. All questions will carry equal marks.

2. The students will be allowed to use non-programmable scientific calculator. However, sharing / ex-change of calculator or any other items are prohibited in the examinations. No programmable calculators, mobile phones or other electrical/ electronic items are allowed in the examination.

Bachelor of Computer Applications (CTIS): Approved in 2ⁿᵈ meeting of Academic Council held on 28.06.2025.

Course Code	Course Title	L	T	P	Credits
BCA-103A	**Digital Logic Design** (Pre-requisite: None)	3	0	0	3
		CIE	**SEE**	**Total**	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-103A.1	Understand the fundamental principles of Number System.
BCA-103A.2	Optimize the logic functions using Boolean principles and K-map.
BCA-103A.3	Analyze various combinational logic circuits and Sequential logic circuits using data path circuits.
BCA-103A.4	Analyze basic Computer Organization including Instruction cycle.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-103A.1	3	2	2	-	-	-	-	2	1	2
BCA-103A.2	3	2	2	2	-	-	-	2	2	-
BCA-103A.3	2	2	2	2	-	-	-	2	-	2
BCA-103A.4	3	3	2	2	-	-	-	3	2	2

Course Contents:

UNIT-I   **Contact Hours: 12**

Number System and Codes

Introduction, Binary Number System, Decimal Number System, Octal Number System, Hexa Decimal Number System and Conversion from one number system to another, Error Detecting and Correcting Codes: Parity Check Code, CRC and Hamming Code, BCD Number System:BCD Codes, Natural Binary Codes, Weighted Codes, Self complementing Codes,Excess-3 Codes and Cyclic Codes, Representation of sign number, Sign magnitude,1's and 2's Complement.

UNIT-II   **Contact Hours: 12**

Boolean Algebra and Logic Gates

Boolean Algebra Postulates, Boolean laws and theorems, Boolean expressions and functions, truth table, canonical representation (SOP, POS), simplification of Boolean function by Boolean algebra, K-Map (up to 4 variables), handling don't care conditions.

Digital Logic Gates: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR, symbols, expressions and truth table, implementation- using NAND and NOR gates.

UNIT-III   **Contact Hours: 10**

Combinational and Sequential Circuit

Combinational Circuit-Introduction, half adder, full adder, half subtractor, full subtractor, multiplexer (2:1,4:1,8:1), demultiplexer (1:2,1:4,1:8), comparators (1 bit and 2 bit), multiplexer, demultiplexer, encoder, decoder, seven segment display, code convertor.

Sequential Circuit- Introduction, Flip Flops (SR, JK, D, T, Master Slave Flip Flop) and their applications, state diagram, state table, excitation table, state equations, characteristic table.

UNIT-IV   **Contact Hours: 11**

Registers and Computer Organization

Register – Designing Registers-Serial in Serial Out Register (SISO), Serial in Parallel Out Register (SIPO), Parallel in Parallel Out Register (PIPO), Parallel in Serial Out Register (PISO), Shift Register.

Basic Computer Organization and Design - Instruction codes, Types of Instructions (Register reference, Memory reference, Input-Output reference), computer registers, addressing modes, instruction cycle.

Text Books:

1. M. Moris Mano (2006), *Computer System Architecture*, 3rd edition, Pearson/PHI, India.
2. Pratima Manhas and Shaveta Thakral, *Digital Electronics*, S.K. Kataria & sons, India
3. P. K. Sinha , *Computer Fundamentals*, 8th edition , BPB Publications, India

Other References:

1. William Stallings (2010), *Computer Organization and Architecture- designing for performance*, 8th edition, Prentice Hall, New Jersy.
2. Anrew S. Tanenbaum (2006), *Structured Computer Organization*, 5th edition, Pearson Education Inc,
3. John P. Hayes (1998), *Computer Architecture and Organization*, 3rd edition, Tata McGrawHill
4. Carl Hamacher, Zvonks Vranesic, SafeaZaky (2002), *Computer Organization*, 5th edition, McGraw Hill, New Delhi, India.

NOTE:
1. For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 5-7 short answer type questions, will be compulsory and based on the entire syllabus. Rest of the eight questions is to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit AND Question no. 1. All questions will carry equal marks.

2. The students will be allowed to use non-programmable scientific calculator. However, sharing / ex-change of calculator or any other items are prohibited in the examinations. No programmable calculators, mobile phones or other electrical/ electronic items are allowed in the examination.

Bachelor of Computer Applications (CTIS): Approved in 2ⁿᵈ meeting of Academic Council held on 28.06.2025.

Course Code	Course Title	L	T	P	Credits
BCA-171A	**Digital Logic Design Lab** (Pre-requisite: None)	0	0	4	2
		CIE	SEE	Total	
		50	50	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-171A.1	Understand the fundamental principles of Number System
BCA-171A.2	Optimize the logic functions using Boolean principles and K-map
BCA-171A.3	Design various combinational logic circuits and Sequential logic circuits using data path circuits.
BCA-171A.4	Analyze basic Computer Organization including Instruction cycle.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-171A.1	3	3	3	2	-	-	-	3	1	2
BCA-171A.2	3	3	3	2	-	-	-	3	2	-
BCA-171A.3	3	3	3	2	-	-	-	3	-	2
BCA-171A.4	3	3	3	2	-	-	-	3	2	2

List of Experiments	
No.	**Experiment Detail**
1.	Draw and realize Trainer Kit and its other components.
2.	Draw and study of different Digital IC's and its specification and Verification of the Truth Table of logic gates using TTL IC's.
3.	Evaluation of a given Boolean function using logic gates in both SOP and POS form.
4.	Design and Implement 4 bit Half Adder using 7483 IC.
5.	Design and Implement 4-bit Full Adder using 7483 IC.
6.	Design and Implement 4:1 Multiplexer using 4153 IC.
7.	Design and Implement 1:4 Demultiplexer using 74155 IC.
8.	Implementation and verification of 2 x 4 decoder using logic gates.
9.	Implementation and verification of 2 x 4 encoder using logic gates.
10.	Design and Implement 4x16 decoder with 3 x 8 decoder
11.	Construct 7 Segment Display Circuit using decoder or 7 Segment LED and test it.
12.	Draw the circuit diagram of a single bit comparator and test the output.
13.	Verification of state table of RS, JK, T and D flip flop using logic gates.
14.	Verify the operations of 4-bit shift register for different modes of operations.

Text Books:

1. M. Moris Mano (2006), *Computer System Architecture*, 3rd edition, Pearson/PHI, India.

Bachelor of Computer Applications (CTIS): Approved in 2nd meeting of Academic Council held on 28.06.2025.

2. Pratima Manhas and Shaveta Thakral, *Digital Electronics*, S.K. Kataria & sons, India
3. P. K. Sinha , *Computer Fundamentals*, 8th edition , BPB Publications, India

Other References:

1. William Stallings (2010), *Computer Organization and Architecture- designing for performance*, 8th edition, Prentice Hall, New Jersy.
2. Anrew S. Tanenbaum (2006), *Structured Computer Organization*, 5th edition, Pearson Education Inc,
3. John P. Hayes (1998), *Computer Architecture and Organization*, 3rd edition, Tata McGrawHill
4. Carl Hamacher, Zvonks Vranesic, SafeaZaky (2002), *Computer Organization*, 5th edition, McGraw Hill, New Delhi, India.

Course Code	Course Title	L	T	P	Credits
BCA-105A	**Problem Solving through C** (Pre-requisite: None)	3	0	0	3
		CIE	SEE	Total	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-105A.1	Understand the basic structure of a C programming
BCA-105A.2	Apply operators, expressions, and various control structures.
BCA-105A.3	Analyze the implement arrays, strings, and user-defined functions
BCA-105A.4	Apply advanced concepts like structure, union and pointers.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-105A.1	3	2	2	2	-	-	-	-	-	-
BCA-105A.2	3	2	2	2	2	2	-	2	-	2
BCA-105A.3	3	2	2	2	2	2	-	2	2	2
BCA-105A.4	3	2	3	2	3	2	-	2	2	2

Course Contents:

UNIT-I   Contact Hours: 12

Fundamentals of C language

Overview of C: History, Importance, Structure of C Program, Character Set, Constants and Variables, Identifiers and Keywords, Data Types, Assignment Statement, Symbolic Constant.
Input/output: Formatted and unformatted I/O Functions-, Input Functions viz. scanf(), getch(), getche(), getchar(), gets(), sscanf(), output functions viz. printf(), putchar(), puts(), sprintf()

UNIT-II   Contact Hours: 10

Operators and Control Structures

Operators & Expression: Arithmetic, Relational, Logical, Bitwise, Unary, Assignment, Conditional Operators and Special Operators, Operator Hierarchy; Arithmetic Expressions, Evaluation of Arithmetic Expression, Type Casting and Conversion.
Control Structures: Decision making Statements- simple if, if else, nested if, else if ladder, switch and break statement, goto statement, Looping Statements: for, while, and do while loop, nested loops, jumps in loops..

UNIT-III   Contact Hours: 11

Arrays, Strings, and Functions

Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays -Declaration, Initialization and Memory representation, Advantages and disadvantages of arrays
Strings: Declaration and Initialization, String I/O, Array of Strings, String Manipulation Functions: String Length, Copy, Compare, Concatenate, Reverse etc.
Functions: Definition, Advantages, prototype, function call, function classification, passing arguments to a function: call by value; call by reference, recursive functions.

UNIT-IV   Contact Hours: 12

Bachelor of Computer Applications (CTIS): Approved in 2ⁿᵈ meeting of Academic Council held on 28.06.2025.

User defined data types, pointers and storage class concepts

User defined data types: Structures Definition, Advantages of Structure, declaring structure variables, accessing structure members, Structure members initialization, Array of Structures; Unions - Union definition; difference between Structure and Union.

Pointers in C: Definition, Advantages, Declaring and initializing pointers, accessing address and value of variables using pointers; Pointers and Arrays, Pointers and Character Strings.

Storage classes in C: Auto, Static, Register, Extern

Text Books:
1. Balagurusamy, E., *Programming in ANSI C*, Tata McGraw-Hill
2. Yashwant Kanetkar, *Let us C*, BPB

Other References:
1. Gottfried, Byron S., *Programming with C*, Tata McGraw Hill
2. Rajaraman, V., *Computer Programming in C*, PHI
3. Jeri R. Hanly & Elliot P. Koffman, *Problem Solving and Program Design in C*, Addison Wesley
4. Brian W. Kernighan, Dennis Ritchie, *The C Programming Language*, Pearson

NOTE:
1. For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 5-7 short answer type questions, will be compulsory and based on the entire syllabus. Rest of the eight questions is to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit AND Question no. 1. All questions will carry equal marks.

2. The students will be allowed to use non-programmable scientific calculator. However, sharing / ex-change of calculator or any other items are prohibited in the examinations. No programmable calculators, mobile phones or other electrical/ electronic items are allowed in the examination.

Bachelor of Computer Applications (CTIS): Approved in 2nd meeting of Academic Council held on 28.06.2025.

Course Code	Course Title	L	T	P	Credits
BCA-173A	**Problem Solving through C Lab** (Pre-requisite: C Programming)	0	0	4	2
		CIE	SEE	Total
		50	50	100

Course Outcomes (COs): At the end of this course, students will be able to

BCA-173A.1	Apply basic input/output operations, operators, and expressions in C
BCA-173A.2	Develop C programs using decision-making and looping constructs
BCA-173A.3	Apply and manipulate arrays, strings, and matrices in C
BCA-173A.4	Construct modular C programs using functions, structures, and pointers.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-173A.1	3	2	2	2	-	–	–	2	-	-
BCA-173A.2	3	3	2	2	1	–	–	2	-	2
BCA-173A.3	3	2	2	2	–	–	–	2	2	2
BCA-173A.4	3	3	2	2	2	–	–	2	2	2

**List of Experiments**
No.	**Experiment Detail**
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1.	An engineer designing circular rides in an amusement park needs to calculate the area and circumference of each ride. Develop a C program that reads radius as input, computes the area and circumference and outputs the results to ensure efficient design.
2.	Develop a C program that implements nested if to find the largest of three numbers.
3.	Develop a C program to read the percentage of marks and display appropriate grades to demonstrate the use of the else-if ladder.
4.	Develop a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
5.	Design a C program to find the roots of a quadratic equation.
6.	Design a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
7.	Design a C program to read a number, find the sum of the digits, reverse the number and check it for palindrome.
8.	A teacher uses a C program to read marks scored by n students. The program stores marks in a single-dimensional array and calculates the average marks of a class.
9.	Implement a C program that finds both the largest and smallest number in a list of integers.
10.	Implement a C program that sorts elements of an array in ascending order.
11.	Create a C program to perform addition and subtraction of matrices.
12.	Create a C program to perform multiplication of two matrices
13.	Create a C program to demonstrate string library functions
14.	Create a C program to find the length of a string and to copy string without using built-in function.

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15.	Create a C program to read, display and add two m x n matrices using functions.
16.	Create a C program that use both recursive and non-recursive functions to find factorial of a given number.
17.	Create a C program that use both recursive and non-recursive functions to generate first n terms of Fibonacci series.
18.	A school administrator uses a C program to manage student records. The program utilizes a student structure to read and display records of n students, ensuring organized and efficient data handling.
19.	Create a C program to swap two numbers using pointers to demonstrate call by reference method for passing arguments in function.
20.	A linguistics researcher uses a C program to analyze text data. The program employs pointers to count vowels and consonants in a given string, ensuring accurate linguistic analysis and data processing.

Text Books:
1. Balagurusamy, E., *Programming in ANSI C*, Tata McGraw-Hill
2. Yashwant Kanetkar, *Let us C*, BPB

Other References:
1. Gottfried, Byron S., *Programming with C*, Tata McGraw Hill
2. Rajaraman, V., *Computer Programming in C*, PHI
3. Jeri R. Hanly & Elliot P. Koffman, *Problem Solving and Program Design in C*, Addison Wesley
4. Brian W. Kernighan, Dennis Ritchie, *The C Programming Language*, Pearson

Syllabus of the Courses offered by other Departments for Bachelor of Computer Applications (CTIS) Semester –I

Course Code	Course Title	L	T	P	Credits
ASH-MAT-115A	**Basics of Mathematics-I** (Pre-requisite: None)	2	0	0	2
		CIE	SEE	Total	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

ASH-MAT-115A.1	Understand the basic concepts of sets, types, various operations and their applications
ASH-MAT-115A.2	Analyze the properties of relation and understand the concept of functions and their types
ASH-MAT-115A.3	Apply the basic operations on matrices, and understand the determinant and inverse of matrices
ASH-MAT-115A.4	Understand Arithmetic progression, Geometric progression, Harmonic progression and evaluate Arithmetic mean, Geometric mean, Harmonic mean and Relation between them.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
ASH-MAT-115A.1	3	2	1	2	-	-	-	2	1	-
ASH-MAT-115A.2	3	3	2	2	-	-	-	2	2	1
ASH-MAT-115A.3	3	3	2	2	-	-	-	2	3	2
ASH-MAT-115A.4	3	2	1	1	-	-	-	2	1	-

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

UNIT-I   **Contact Hours: 7**

Set Theory

Sets and their representations, Empty set, Finite and infinite sets, Subsets, Equal sets, Power sets, Universal set, Union and intersection of sets, Difference of two sets, Complement of a set, Venn diagram, De-Morgan's laws and their applications

UNIT-II   **Contact Hours: 6**

Relation and Function

Properties of relations, equivalence relation, Functions: Definition, domain and range of function, Injective function, Surjective function, Bijective function, composite and inverse function

UNIT-III   **Contact Hours: 9**

Matrices and Determinants

An introduction to matrices and their types, Operations on matrices, Symmetric and skew-symmetric matrices, Minors, Co-factors. Determinant of a square matrix, Adjoint and inverse of a square matrix, Solutions of system of Linear equations of three variables.

UNIT-IV   **Contact Hours: 8**

Sequence and Series

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Basics of Logarithms, Arithmetic progression, Geometric progression, Harmonic progression, Arithmetic mean (A.M.), Geometric mean (G.M.), Harmonic mean (H.M.), Relation between A.M., G.M. and H.M.

Text Books:

1. J. P. Tremblay and P. Manohar, *Discrete Mathematical Structures with Applications to Computer Science*, Tata McGraw Hill.
2. C. L. Liu and D. P. Mohapatra, *Elements of Discrete Mathematics-A Computer Oriented Approach,* Tata McGraw Hill.
3. S.C. Malik and Savita Arora, *Mathematical Analysis*, New Age publication
4. J.K. Thukral, *Business Mathematics*.

Other References:

1. K. H. Rosen, *Discrete Mathematics and its Applications*, 7th ed., McGraw – Hill

Bachelor of Computer Applications **(CTIS)**: *Approved in 2ⁿᵈ meeting of Academic Council held on 28.06.2025.*

Course Code	Course Title	L	T	P	Credits
BT-CE-104A	**Environmental Studies** (Pre-requisite: None)	2	0	0	2
		CIE	SEE	Total	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

BT-CE-104A.1	Understand the importance of environmental studies and natural resource.
BT-CE-104A.2	Illustrate the structure and functions of ecosystems, analyze biodiversity threats, and evaluate conservations.
BT-CE-104A.2	Evaluate the causes, effects, and control measures of environmental pollution, solid waste management and disaster management.
BT-CE-104A.3	Discuss the emerging environmental issues and environmental pollution act.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BT-CE-104A.1	-	2	-	1	-	-	2	2	-	-
BT-CE-104A.2	2	3	2	2	2	2	3	2	2	2
BT-CE-104A.2	2	3	3	2	2	2	3	2	-	2
BT-CE-104A.3	-	2	3	2	2	-	2	3	-	-

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

<div align="center">

UNIT-I   **Contact Hours: 8**

</div>

Introduction to environmental studies and Natural resources

Multidisciplinary nature of environmental studies: Definition, Scope and Importance. Need for public awareness.
Natural Resources: Renewable and Non-Renewable Resources: Natural resources and associated problems. (a) Forest Resources: Use and over-exploitation, deforestation, case studies. (b) Energy Resources- Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies. (c) Land Resources- Land as a resource, land, degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyle.

<div align="center">

UNIT-II   **Contact Hours: 8**

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Ecosystem, Biodiversity and Conservation

Ecosystem: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem. Food Chains, food webs.
Biodiversity and its conservation: Introduction, Definition: genetic, species and ecosystem diversity. Biogeographical classification of India, Value of biodiversity, Hot spots of Biodiversity. Threats to biodiversity: Habitat loss, poaching of wild life, man-wildlife conflicts. Endangered and endemic species of India, Conservation of Biodiversity- In situ and Ex-Situ conservation of biodiversity.

<div align="center">

UNIT-III   **Contact Hours: 8**

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Environmental pollution, Solid waste management, and Disaster management

Environmental Pollution: Definition, Cause, effects and control measures of- (a) Air Pollution (b) Water Pollution (c) Soil Pollution (d) Marine Pollution. Visit to a local polluted site- Urban /Rural/Industrial/Agricultural. (Field work equal to 5 lecture hours).
Solid waste management: cause, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution, E- waste management, plastic waste.
Disaster management: Natural: floods, earthquake, cyclone and landslides etc. Man-made Disaster: Fire, industrial pollution, nuclear disaster, biological Disaster, Disaster preparedness plans.

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Emerging Issues and Environment Protection Act

Social Issues and the Environment: From unsustainable to sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people: Its problems and concerns.

Environmental ethics-issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, Case studies, Concept of green building, carbon foot printing.

Environment Protection Act (Air,water, wildlife, forest), Environment and human health, Role of Information Technology in Environment and Human Health, Case Studies. Emerging technologies for Environmental management.

Text Books:
1. Deswal and Deswal, *Environmental Studies*, Dhanpat Rai & Co.
2. Anandan, P. and Kumaravelan, R., *Environmental Science & Engineering*, Scitech Publications (India) Pvt. Ltd.
3. Bharucha, E., *A Textbook of Environmental Studies for Undergraduate Courses*, Orient Blackswan Pvt. Ltd.

Reference Books:
1. Daniels Ranjit R. J. and Krishnaswamy, Environmental Studies, Wiley India
2. Botkin and Keller, *Environmental Science*, Wiley
3. Joshi, P.C. and Joshi, N., *A Text Book of Environmental Science*, APH Publishing Corporation.
4. Basu, M. and Xavier Savarimuthu, S.J., *Fundamentals of Environmental Studies*, Cambridge University Press.

Course Code	Course Title	L	T	P	Credits
ASH-HUM-117A	**English Language and Communication-1** (Pre-requisite: None)	2	0	0	2
		CIE	**SEE**	**Total**	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

ASH-HUM-117A.1	Understand and remember the basic concepts of communication skills and its usage in day to day life.
ASH-HUM-117A.2	Classify, interpret, differentiate, and organize the learned knowledge.
ASH-HUM-117A.3	Develop and execute listening and writing skills.
ASH-HUM-117A.4	Learn group discussion skills.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
ASH-HUM-117A.1	2	2	2	-	2	-	-	2	-	2
ASH-HUM-117A.2	2	2	2	-	2	2	2	2	-	2
ASH-HUM-117A.3	2	3	2	2	3	2	2	2	2	-
ASH-HUM-117A.4	2	3	2	2	3	-	3	3	-	-

UNIT-I   **Contact Hours: 8**

Communication Skills and Barriers

Communication Skills: Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context
Barriers to communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers
.

UNIT-II   **Contact Hours: 8**

Elements of Communication and Perspectives

Elements of Communication: Introduction, Face to Face Communication – Tone of voice, Body Language (Non-Verbal Communication), Verbal Communication Physical Communication.
Perspectives in Communication: Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment

UNIT-III   **Contact Hours: 8**

Listening and Written Communication skills

Basic Listening Skills: Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations.
Effective Written Communication: Introduction, When and When Not to Use Written Communication - Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication.

UNIT-IV   **Contact Hours: 6**

Group Discussion

Introduction to Group Discussion**,** Communication skills in group discussion, Do's and Don'ts of group discussion

Textbooks:
1. Andreja. J. Ruther Ford, *Basic communication skills for Technology,* 2nd Edition, Pearson Education
2. Sanjay Kumar, Pushpalata, *Communication skills*, Oxford Press
3. Stephen. P. Robbins, *Organizational Behavior,* Pearson
4. Gill Hasson, *Brilliant- Communication skills*, Pearson Life
5. GopalaSwamy Ramesh, *The Ace of Soft Skills: Attitude, Communication and Etiquette for success*, Pearson

Other references:
1. Deborah Dalley, Lois Burton, Margaret, Greenhall, *Developing your influencing skills*, Universe of Learning LTD
2. Konar nira, 2nd Edition, *Communication skills for professionals,* New arrivals –PHI
3. Barun K Mitra, *Personality development and soft skills*, Oxford Press
4. Butter Field, *Soft skill for everyone,* 1st Edition, Cengage Learning India pvt.ltd
5. Francis Peters SJ, *Soft skills and professional communication*, McGraw Hill Education
6. John Adair, *Effective communication*, Pan Mac Millan
7. Aubrey Daniels, *Bringing out the best in people,* Mc Graw Hill.

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Course Code	Course Title	L	T	P	Credits
BBA-215A	Digital Marketing	2	0	0	2
		CIE	SEE		Total
		40	60		100

Course Outcomes

CO1	Discuss the historical perspective and key milestones in the evolution of digital marketing.
CO2	Apply strategies for effective social media marketing, email marketing, and affiliate marketing.
CO3	Analyze data to inform digital marketing strategies and decisions.
CO4	Evaluate the impact of digital wellbeing and ethical considerations in digital marketing practices.

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	2	3	2	2	-	-	-	1	-	2
CO2	2	2	3	3	2	1	-	2	2	2
CO3	1	3	2	3	1	-	-	2	2	3
CO4	2	2	1	-	-	-	3	3	1	2

Course Outline

Unit Number: 1	**Digital Marketing and Search Engine Marketing**	Contact Hours: 8
Foundations and Evolution of Digital Marketing: Historical Perspective and Key Milestones: Transition from traditional to digital marketing channels Search Engine Marketing (SEM): Fundamentals of search engine optimization (SEO) and its role in digital marketing, pay-per-click (PPC) advertising strategies and best practices, importance of keyword research and targeting in SEM campaigns		
Unit Number: 2	**Social Media and Email marketing**	Contact Hours: 6
Social Media Marketing: Strategies for leveraging social media platforms, creating engaging content, understanding social media metrics, and building brand presence. Email Marketing: Role of email marketing in the digital marketing mix, strategies for building and maintaining email lists, personalization, segmentation, and automation in email campaigns		
Unit Number: 3	**Data Analytics in Digital marketing**	Contact Hours: 8
Digital Marketing, Data, and Analytics: Role of data in informing digital marketing strategies and decisions. Social Media Advertising and Analytics: Tools for social media Advertising; Planning and executing social media campaigns; An Overview of social media analytics tools.		
Unit Number: 4	**Digital Wellbeing and Ethics**	Contact Hours: 8
Digital Wellbeing: Understanding digital stress and its impact on mental health, strategies for promoting digital detox and mindfulness in the digital age, incorporating principles of digital wellbeing into digital marketing practices. Ethical Issues in Digital Marketing: Ethical considerations, privacy concerns, and legal aspects of digital marketing		

Textbooks:
1. Chaffey, Dave and Fiona Ellis Chadwick, *Digital Marketing- Strategy, Implementation and Practice*, Pearson Education Inc.
2. Ahuja, Vandana, *Digital Marketing*, Oxford University Press

Other references:
1. Hanson, W and Kirthi Kalyanam, *Internet Marketing and E-Commerce*, Cengage Learning
2. Mullen, J and D Daniels, *E-Marketing- An Hour a Day*, Sybex Publisher
3. Kotler et. Al, *Principles of Marketing*, Pearson Education Inc., New Delhi
4. Kaufman, Era and Chris Hortan, *Digital Marketing- Integrating Strategies and Tactics with Values*, Routledge

Bachelor of Computer Applications (CTIS): Approved in 2ⁿᵈ meeting of Academic Council held on 28.06.2025.

Bachelor of Computer Applications
(Cloud Technology and Information Security)
Semester–II

Course Code	Course Title	L	T	P	Credits
BCA-102A	**Operating System** (Pre-requisite: None)	3	0	0	3
		CIE	**SEE**	**Total**	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-102A.1	Understand the fundamental concepts of operating systems.
BCA-102A.2	Apply process scheduling algorithms to solve process management problems
BCA-102A.3	Interpret memory management techniques and virtual memory.
BCA-102A.4	Implement file systems and disk scheduling algorithms.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-102A.1	3	2	2	2	-	-	-	2	-	-
BCA-102A.2	3	3	2	2	2	1	-	2	2	-
BCA-102A.3	3	2	2	3	-	-	-	2	3	2
BCA-102A.4	3	2	2	3	2	2	2	2	2	2

Course Contents:

<div align="center">UNIT-I   Contact Hours: 11</div>

Fundamentals of Operating System and Processes

Introduction of Operating System: Definition, Functions & Characteristics; Operating System Services; Operating System Architecture; Types of Operating system: Batch, Multiprogramming, Multi Processing, Time-sharing, Real-time, Distributed; System Programs and System calls.

Processes: Definition, Process states, Process Control Block, Operations on Processes, inter process Communication, Threading and Multithreading.

<div align="center">UNIT-II   Contact Hours: 12</div>

Process Scheduling, Synchronization and Deadlocks

Process Scheduling: Definition, Types of Schedulers, Scheduling Criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time (Definition only), Scheduling algorithms: Preemptive and Non - Preemptive, FCFS, SJF, Priority, RR, and Multi-level Queue (with and without Feedback) Scheduling.

Synchronization: Critical Section Problem, Semaphores, Classical Problem of Synchronization.

Deadlocks: Definition, Necessary conditions for Deadlock, Methods for handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery.

<div align="center">UNIT-III   Contact Hours: 12</div>

Memory Management

Memory Concepts: Logical and Physical Address Space, Swapping, Internal and External Fragmentation.

Memory Allocation Techniques: Contiguous Memory Allocation- Single and Multi-Partitioned, Non-Contiguous Memory Allocation – Paging and Segmentation.

Virtual Memory Management: Demand Paging, Page-Replacement Algorithms: FIFO, LRU, Optimal, Thrashing.

<div align="center">UNIT-IV   Contact Hours: 10</div>

File and Directory management, Disk Scheduling algorithms

File Concept: File System and its Functions, Different types of Files and their access methods.

Bachelor of Computer Applications (CTIS): Approved in 2ⁿᵈ meeting of Academic Council held on 28.06.2025.

Directory: Directory Structures, Directory Operations, Directory Allocation Methods.

Disk Scheduling: Disk Structure, Disk Scheduling Algorithms: First come First Serve (FCFS), Shortest Seek Time First (SSTF), SCAN, C-SCAN, LOOK, C- LOOK.

Text Books:
1. Silberschatz A., Galvin P.B., and Gagne G., *Operating System Concepts*, John Wiley & Sons.
2. Godbole, A.S., *Operating Systems*, Tata McGrawHill Publishing Company, New Delhi.

Reference Books:
1. William Stallings, *Operating Systems: Internals and Design Principles*, Prentice Hall
2. William S. Davis and T. M. Rajkumar, *Operating Systems: A Systematic View*, Pearson.

NOTE:
1. For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 5-7 short answer type questions, will be compulsory and based on the entire syllabus. Rest of the eight questions is to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit AND Question no. 1. All questions will carry equal marks.

2. The students will be allowed to use non-programmable scientific calculator. However, sharing / ex-change of calculator or any other items are prohibited in the examinations. No programmable calculators, mobile phones or other electrical/ electronic items are allowed in the examination.

Bachelor of Computer Applications (CTIS): Approved in 2ⁿᵈ meeting of Academic Council held on 28.06.2025.

Course Code	Course Title	L	T	P	Credits
BCA-112A	**Data Structures using C++** (Pre-requisite: C Programming)	3	0	0	3
		CIE	**SEE**	**Total**	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-112A.1	Understand the fundamentals of Object-Oriented Programming (OOP) in C++
BCA-112A.2	Explore the Data Structures concepts and operations of Arrays and Strings
BCA-112A.3	Examine the features and operations of Stack and Queue data structure.
BCA-112A.4	Implement searching and sorting algorithms and linked lists operations.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-112A.1	3	2	2	-	-	-	-	2	2	1
BCA-112A.2	3	2	2	2	-	-	-	2	-	2
BCA-112A.3	3	3	2	3	2	-	-	2	2	2
BCA-112A.4	3	3	3	3	-	2	-	2	2	2

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

<div align="center">

UNIT-I   **Contact Hours: 10**
</div>

Object-Oriented Programming concepts

Object-Oriented Programming: Object-Oriented programming features and benefits. Object-Oriented features of C++, Class and Objects, Data Hiding & Encapsulation, Structures, Data members and Member functions, Scope resolution operator and its significance, Accessing Members of Class and Structure, Passing and Returning Objects to Functions.

<div align="center">

UNIT-II   **Contact Hours: 11**
</div>

Introduction to Data Structures and Arrays

Basic data Structure: Introduction to Data Structures, algorithms and Pseudo code, Types of Data Structures, Relationship among data, data structures, and algorithms, Abstract Data Types, Analysis of Algorithms, asymptotic notations, asymptotic analysis.

Arrays, Representation of Arrays in Memory, Operations on Array (Traversing, Insertion, Deletion), Strings and its Representation in Memory, Operations on Strings (length, reverse).

<div align="center">

UNIT-III   **Contact Hours: 12**
</div>

Stacks and Queues

Stacks: Introduction, Representation of Stacks Using Sequential Organization (Arrays), Applications of Stack, Expression Evaluation and Conversion, Polish notation and expression conversion, Processing of Function Calls, Reversing a String with a Stack, Recursion. Stack Abstract Data Type

Queues: Concept of Queues, Realization of Queues Using Arrays, Circular Queue, Multi-queues, Dequeue, Priority Queue, Applications of Queues, Queue as Abstract Data Type

<div align="center">

UNIT-IV   **Contact Hours: 12**
</div>

Linked Lists, Searching and Sorting techniques

Linked Lists: Introduction, Types (singly, double, circular, circular double) and Operations (Insertion, Deletion, Traversal, Searching, Sorting), Applications.

Searching and Sorting: Search Techniques-Linear Search, Binary Search, Sorting Techniques- Selection Sort, Bubble Sort, Insertion Sort, Merge Sort, Quick Sort, Comparison of Sorting Methods

Text Books:

Bachelor of Computer Applications (CTIS): Approved in 2ⁿᵈ meeting of Academic Council held on 28.06.2025.

1. Michael T. Goodrich, R. Tamassia and Mount, *Data structures and Algorithms in C++,* John Wiley and Sons.

2. Mark Allen Weiss, *Data structures and Algorithm Analysis in C++,* Pearson Education.

3. Robert L. Kruse and A.J. Ryba, *Data Structures and Program Design in C++*, Prentice Hall, Inc., NJ

4. Herbert Scildt, *C++ The Complete Reference*, Tata McGraw-Hill

Reference Books:
1. Narasimha Karamanchi, *Data Structures and Algorithms Made Easy,* CareerMonk Publications

2. Adam Drozdek, *Data Structures and Algorithms in C++*, Course Technology.

3. Balaguruswami, E., *Object Oriented Programming In C++,* Tata McGraw-Hill.

NOTE:
1. For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 5-7 short answer type questions, will be compulsory and based on the entire syllabus. Rest of the eight questions is to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit AND Question no. 1. All questions will carry equal marks.

2. The students will be allowed to use non-programmable scientific calculator. However, sharing / ex-change of calculator or any other items are prohibited in the examinations. No programmable calculators, mobile phones or other electrical/ electronic items are allowed in the examination.

Bachelor of Computer Applications **(CTIS):** *Approved in 2nd meeting of Academic Council held on 28.06.2025.*

Course Code	Course Title	L	T	P	Credits
BCA-182A	**Data Structures using C++ Lab** (Pre-requisite: C++)	0	0	4	2
		CIE	**SEE**	**Total**	
		50	50	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-182A.1	Design and implementation of various operations on arrays in C++..
BCA-182A.2	Implement various operations on Linked lists.
BCA-182A.3	Apply various operations on stack and queue data structures.
BCA-182A.4	Implement searching and sorting techniques in C++.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-182A.1	3	2	2	2	-	-	-	2	2	2
BCA-182A.2	3	2	2	2	2	-	-	2	-	2
BCA-182A.3	3	3	3	2	2	-	-	2	2	2
BCA-182A.4	3	3	3	2	-	2	-	3	2	2

List of Experiments	
No.	**Experiment Detail**
1.	Write a program to remove the duplicates from an array.
2.	Write a program that prints a table indicating the number of occurrences of each alphabet in the text entered.
3.	Write a program that uses functions to perform the following operations on an array (a) Creation (b) Insertion (c) Deletion (d) Traversal.
4.	Write a program to implement simple Stack using array to perform the following operations: (a) Create (b) Peek (c) Push (d) Pop (e) Traverse
5.	Write a menu driven program that implements singly linked list for the following operations: (b) Creation (b) Insertion (c) Deletion (d) Traversal.
6.	Write a menu driven program that implements doubly linked list for the following operations: Create, Display, Insert, Delete, Search,
7.	Write a program to implement simple Stack using Link list to perform the following operations: (a) Create (b) Peek (c) Push (d) Pop (e) Traverse
8.	Write a program to implement simple Queue using array to perform the following operations: (a) Create (b) Enqueue (c) Dequeue (d) Traverse
9.	Write a program to implement circular Queue using array to perform the following operations: (a) Create (b) Enqueue (c) Dequeue (d) Traverse
10.	Write a program to search an elements in an array using linear search technique.
11.	Write a program to search an elements in an array using binary search technique.
12.	Write a program to sort the elements using Insertion Sort algorithm.
13.	Write a program to sort the elements using Bubble Sort algorithm.

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14.	Write a program to sort the elements using Quick Sort algorithm.
15.	Write a program to sort the elements using Merge Sort algorithm.
16.	Write a program to sort the elements using Selection Sort algorithm.

Text Books:
1. Michael T. Goodrich, R. Tamassia and Mount, *Data structures and Algorithms in C++,* John Wiley and Sons.
2. Mark Allen Weiss, *Data structures and Algorithm Analysis in C++,* Pearson Education.
3. Robert L. Kruse and A.J. Ryba, *Data Structures and Program Design in C++*, Prentice Hall, Inc., NJ
4. Herbert Scildt, *C++ The Complete Reference*, Tata McGraw-Hill

Reference Books:
1. Narasimha Karamanchi, *Data Structures and Algorithms Made Easy,* CareerMonk Publications
2. Adam Drozdek, *Data Structures and Algorithms in C++*, Course Technology.
3. Balaguruswami, E., *Object Oriented Programming In C++,* Tata McGraw-Hill.

Bachelor of Computer Applications (CTIS): Approved in 2nd meeting of Academic Council held on 28.06.2025.

Course Code	Course Title	L	T	P	Credits
BCA-114A	**Introduction to Cloud Computing** (Pre-requisite: None)	2	0	0	2
		CIE	SEE	Total	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-114A.1	Understand the fundamentals, evolution, characteristics, and architectures of cloud computing
BCA-114A.2	Illustrate different cloud service and deployment models, and understand the structure and lifecycle of Service Level Agreements (SLAs).
BCA-114A.3	Learn cloud resource virtualization, including hypervisors, instances, and VM provisioning.
BCA-114A.4	Explore various cloud applications, security issues, and tools used in cloud computing.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-114A.1	3	-	-	2	-	-	-	2	2	1
BCA-114A.2	3	-	2	2	2	-	-	2	3	2
BCA-114A.3	3	2	3	3	3	-	-	2	3	2
BCA-114A.4	2	2	2	3	2	-	3	3	2	3

Course Contents:

UNIT-I   **Contact Hours: 7**

Introduction to cloud computing

Introduction to cloud computing: Introduction to cloud, Evolution, Characteristics, Business Benefits, Challenges, Fundamental Cloud Architectures, Applications.

UNIT-II   **Contact Hours: 8**

Service and Deployment Models and Service level agreements

Service Models (XaaS): Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS)
Deployment Models: Types of cloud - Public cloud - Private cloud - Hybrid cloud
Service Level Agreements: Types of SLA, Lifecycle of SLA, SLA Management.

UNIT-III   **Contact Hours: 8**

Virtualization and Instances

Virtualization as Foundation of Cloud, Understanding Hypervisors, Understanding Machine, Image and Instances, Managing Instances: Virtual Machine Provisioning and Service Migrations, VirtualBox.

UNIT-IV   **Contact Hours: 7**

Clouds, Security and Tools

Media Clouds, Security Clouds, Computing Clouds, Mobile Clouds, Federated Clouds, Hybrid Clouds.
Cloud Computing and Security: Risks in Cloud Computing, Data Security in Cloud, Cloud
Security Services
Cloud Computing Tools: Tools and Technologies for Cloud.

Text Books:
1. A. Srinivasan and J. Suresh, *Cloud Computing –A Practical Approach for Learning and Implementation*, Pearson India Publications.
2. Rajkumar Buyya, James Broberg, Andrzej, M. Goscinski, *Cloud Computing: Principles and Paradigms*, Wiley

Reference Books:

Bachelor of Computer Applications (CTIS): Approved in 2^(nd) meeting of Academic Council held on 28.06.2025.

1. Arshdeep Bahga and Vijay Madisetti, *Cloud Computing –A Hands on Approach*, Universities Press (India) Pvt Ltd.
2. Toby Velte, Anthony Velte, Robert Elsenpeter*, Cloud Computing: A Practical Approach*, Mc Graw Hill Education

NOTE:
1. For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 5-7 short answer type questions, will be compulsory and based on the entire syllabus. Rest of the eight questions is to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit AND Question no. 1. All questions will carry equal marks.

2. The students will be allowed to use non-programmable scientific calculator. However, sharing / ex-change of calculator or any other items are prohibited in the examinations. No programmable calculators, mobile phones or other electrical/ electronic items are allowed in the examination.

Course Code	Course Title	L	T	P	Credits
BCA-106A	**Introduction to Web Technology** (Pre-requisite: None)	3	0	0	3
		CIE	**SEE**	**Total**	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-106A.1	Understand the evolution and components of the Internet.
BCA-106A.2	Explore the basic and advance elements of HTML in designing web pages.
BCA-106A.3	Apply CSS for Web Page Styling and Layout.
BCA-106A.4	Analyze Dynamic Web Functionality Using JavaScript.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-106A.1	3	2	-	2	-	-	-	2	3	2
BCA-106A.2	3	2	2	2	-	-	-	2	2	2
BCA-106A.3	3	2	2	3	2	2	-	2	2	2
BCA-106A.4	3	3	3	3	2	2	-	2	3	3

Course Contents:

<div align="center">

UNIT-I   **Contact Hours: 12**
</div>

Introduction to Internet and Web Publishing

Introduction to Internet and its Components: Evolution and History of World Wide Web, Web Pages and Contents, Web Clients, Web Servers, Web Browsers, Hypertext Transfer Protocol, HTTP Request Message, Response Message, URLs, Searching, Dynamic and Static Website, Search Engines and Search Tools.

Web Publishing: Hosting website, Internet service provider, Planning and designing website, Steps for developing website.

<div align="center">

UNIT-II   **Contact Hours: 11**
</div>

Basics of Hyper Text Mark-up Language (HTML)

Introduction, History of HTML, Introduction to DHTML, Structure of HTML Page, HTML tags versus HTML elements, HTML Basic Formatting Tags and attributes of tag, Paragraph Tag, Comments in HTML, Heading Tag, Div Tag, Span Tag , Different types of List Tag- Unordered Lists, Ordered Lists, Definition list, Image Tag, Hyperlink-Internal and External, Table tag and its attributes , iFrame, Forms in HTML, Post and Get method

<div align="center">

UNIT-III   **Contact Hours: 12**
</div>

Introduction to Cascading Style Sheet (CSS)

Basic Concepts, CSS Syntax, Features of CSS3, Style Rule: Cascading and Inheritance, Creating Style Sheets, CSS Selectors, CSS Comments, CSS Text Properties, CSS Colour Methods, Background Properties, Cursor Properties, CSS Table and List Properties, CSS Box Model, CSS Positioning, CSS Display Properties, CSS Float Properties.

<div align="center">

UNIT-IV   **Contact Hours: 10**
</div>

Java Script and Document Object Model (DOM)

Introduction to JavaScript: History of JavaScript, Features of JavaScript, JavaScript basic programming: Variables, Operators, String manipulation, Control statements, Functions, Callback, JavaScript OOPs, Object, and Inheritance.

Working with HTML DOM: Finding HTML Elements, Changing HTML Elements, Adding and Deleting Elements, Adding Events Handlers.

Text Books:
1. Jon Duckett, *HTML and CSS: Design and Build Webs*, Wiley
2. Julie Meloni, *HTML, CSS and JavaScript All in One*, Sams Teach Yourself: Covering HTML5, CSS3, and jQuery, Sams Publishing.

Bachelor of Computer Applications (CTIS): Approved in 2ⁿᵈ meeting of Academic Council held on 28.06.2025.

Reference Books:
1. Raj Kamal, *Internet and Web Technologies*, Tata McGrawHill.
2. Ramesh Bangia, *Multimedia and Web Technology*, Firewall Media.

NOTE:
1. For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 5-7 short answer type questions, will be compulsory and based on the entire syllabus. Rest of the eight questions is to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit AND Question no. 1. All questions will carry equal marks.

2. The students will be allowed to use non-programmable scientific calculator. However, sharing / ex-change of calculator or any other items are prohibited in the examinations. No programmable calculators, mobile phones or other electrical/ electronic items are allowed in the examination.

Course Code	Course Title	L	T	P	Credits
BCA-174A	**Web Technology Lab** (Pre-requisite: HTML, CSS, JavaScript)	0	0	4	2
		CIE	SEE	Total	
		50	50	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-174A.1	Apply basic and advanced HTML elements to design web pages
BCA-174A.2	Implement CSS properties to enhance the functionality of HTML page
BCA-174A.3	Utilize JavaScript basic concepts to create dynamic web pages
BCA-174A.4	Implement event handling features of JavaScript in designing dynamic web pages

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-174A.1	3	2	2	2	-	-	-	2	3	2
BCA-174A.2	3	2	2	2	2	2	-	2	2	2
BCA-174A.3	3	3	2	2	2	2	-	2	2	2
BCA-174A.4	3	3	3	3	2	2	-	2	3	3

List of Experiments	
No.	**Experiment Detail**
1.	Design a web page to demonstrate various text formatting HTML tags.
2.	Create ordered and unordered lists to display items, such as a list of favorite movies or a to-do list.
3.	Design a simple resume page with sections for personal information, education, experience, and skills.
4.	Create a simple image gallery with captions using the <img> tag
5.	Create a webpage with different section and demonstrate internal link.
6.	Create a table where some cells span multiple columns (using colspan) and rows (using rowspan).
7.	Develop a web page to demonstrate the use of the <iframe> tag to embed an external webpage within another HTML page
8.	Create registration form include different input types, radio buttons, checkboxes, and dropdown menus.
9.	Create a webpage and styling HTML Elements with CSS.
10.	Implement a CSS file and attach it to any 3 HTML webpages.
11.	Design a static website with HTML and CSS for a organization include pages like Home, About, Services, and Contact.
12.	Design a webpage with a form. Upon submission, a new page opens displaying "Message has been sent" in an alert box, ensuring user feedback and interaction.
13.	Create a Basic Calculator having add, subtract, multiply and division operators.
14.	Implement a JavaScript function to verify if a string reads the same forwards and backwards, ensuring efficient string manipulation.
15.	Create a 'to do' list (add and remove HTML Elements) with JavaScript by click event.
16.	Design an interactive image slider using JavaScript. Users can click buttons to navigate through images. JavaScript handles image changes dynamically, enhancing user engagement and

| | | showcasing practical DOM manipulation skills in web development. |

Text Books:
1. Jon Duckett, *HTML and CSS: Design and Build Webs*, Wiley
2. Julie Meloni, *HTML, CSS and JavaScript All in One*, Sams Teach Yourself: Covering HTML5, CSS3, and jQuery, Sams Publishing.

Reference Books:
1. Raj Kamal, *Internet and Web Technologies*, Tata McGrawHill.
2. Ramesh Bangia, *Multimedia and Web Technology*, Firewall Media.

Course Code	Course Title	L	T	P	Credits
BCA-377A	**Industrial Internship** (Pre-requisite: None)	0	0	0	4
		CIE	SEE	Total	
		100	-	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-377A.1	Examine and evaluate problems given by industry.
BCA-377A.2	Learn professional skills such as teamwork, communication, and project management in an industry setting.
BCA-377A.3	Employ industry-standard tools and technologies to successfully complete assigned tasks and projects.
BCA-377A.4	Develop comprehensive documentation summarizing project outcomes, and detailing the skills acquired during the internship.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-377A.1	2	3	-	–	–	-	–	–	2	-
BCA-377A.2	2	–	–	3	3	3	2	3	3	2
BCA-377A.3	3	3	3	3	3	2	-	2	3	3
BCA-277A.4	2	–	3	3	3	-	2	3	-	-

Guidelines for Industrial Training/ Internship: This course requires students to participate in professional employment-related activity or work experience or co-operative education activity with an entity external to the educational institution, normally under the supervision of an employee of an organization or an individual professional. A key aspect of the internship is induction into actual, formal, and organized work situation. Internship involves working with government or private industry, training or high-end educational organizations (such as IITs, etc.), business establishments, etc. to provide opportunities for students to actively engage in on-site experiential learning.

a) The candidate shall be required to undergo industrial trainings /internships of the specified duration, provided in the Scheme of Studies and Examinations, in an industry/ business enterprise/ organization approved by the Head of the Department.

b) If the concerned Department perceives any limitations from the industry to accommodate all the enrolled students, a student may be permitted to complete a skill-oriented e-content course (of sufficient duration) relevant to the industry or undertake a project-based / research project under the supervision of a faculty of a premier Institute (such as I.I.T., I.I.Sc.) with prior approval from the competent authority.

c) The Training will be completed under the supervision of the officer (herein called Co. Training Supervisor) of the Company/ Organization under whose guidance and supervision the training was allotted to the candidate.

d) A student can do industrial training/internship of 45-60 days duration during summer vacation after the 2nd or 4th semester before taking an exit or completing the degree programme in the respective discipline. It will be of 4 credits.

e) If a student pursues 3 years UG Programme in respective discipline without taking Exit option, this internship (either done after 2nd or 4th semester) will be taken into account in 5th semester.

f) If a student takes Exit after 2 years in UG Programme, this internship (either done after 2nd or 4th semester) will be taken into account in 4th semester.

g) If a student takes Exit after 1 year in UG Programme, the mandatory internship done after 2nd semester will be taken into account in 2nd semester.

h) However, for those students who have taken lateral entry into the 3rd semester and have completed internship of 45-60 days duration during first year, the internship is not required after the 4th semester.

Bachelor of Computer Applications (CTIS): Approved in 2nd meeting of Academic Council held on 28.06.2025.

i) The candidates are required to submit a comprehensive report Training Supervisor within two weeks of completion of the training along with Co. Training Supervisor's Certificate in the beginning of the report stating that the report is an outcome of the work done by the candidate during his/her training.

j) The viva-voce shall be held by Internal Examiner within two weeks after submission of the report.

k) The Industrial Training/ Internship has only CIE component of 100 marks that shall be conducted as given in Table-1.

Table-1: Relative Weightages of Industrial Training/ Internship

Component	Description of the Component		Relative Weightage (Out of 100)
CIE	i)	Internship Synopsis Evaluation within 10 days of start of Internship	20
	ii)	Mid-Term Internship Evaluation	30
	iii)	Final Presentation and Internship Evaluation	50
		CIE Total	**100**
SEE	NIL		NIL
		Grand Total	**100**

Syllabus of the Courses offered by other Departments for
Bachelor of Computer Applications (CTIS)
Semester –II

Course Code	Course Title	L	T	P	Credits
ASH-MAT-116A	**Basics of Mathematics-II** (Pre-requisite: Basics of Mathematics-I)	2	0	0	2
		CIE	**SEE**	**Total**	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

ASH-MAT-116A.1	Understand the limit, and continuity of functions
ASH-MAT-116A.2	Understand the basic concepts of differentiation.
ASH-MAT-116A.3	Evaluate the Integration of algebraic and transcendental functions.
ASH-MAT-116A.4	Understand the basic concepts of Vector calculus including gradient, divergence and curl.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
ASH-MAT-116A.1	3	2	-	2	-	-	-	2	2	-
ASH-MAT-116A.2	3	2	1	2	-	-	-	2	2	2
ASH-MAT-116A.3	3	2	2	2	-	-	-	2	3	-
ASH-MAT-116A.4	3	2	2	2	-	-	-	2	3	-

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

UNIT-I   **Contact Hours: 8**

Limit and Continuity

Limit and Continuity: Limit at a point, Properties of limit, Computation of limits of various types of functions, Continuity of a function at a point, Continuity over an Interval, Properties of continuous functions.

UNIT-II   **Contact Hours: 7**

Differentiation

Concept of Differentiation, Differentiation of simple, algebraic, trigonometric, logarithmic, and exponential functions, Differentiation of sum, difference, product and quotient of functions.

UNIT-III   **Contact Hours: 8**

Indefinite integrals

Indefinite integrals: Integration of algebraic, trigonometric, exponential and logarithmic functions, Methods of integration: by substitution and by parts.

UNIT-IV   **Contact Hours: 7**

Vector Calculus

Vector Calculus: Scalars, vectors, dot product and cross product of vectors, partial differentiation of scalar and vector point function, basic concepts of - gradient of scalar, divergence and curl of a vector.

Text Books:
1. S. C. Malik and Savita Arora, *Mathematical Analysis*, New Age Publication.
2. J. K. Thukral, *Business Mathematics*, the World Book Depot.
3. Murray Spiegel, Seymour Lipschutz, Dennis Spellman, *Schaum's Outlines Vector Analysis*

Reference Books:
1. A. Tussy, R. Gustafson and D. Koenig, *Basic Mathematics for College Students*, Brooks Cole

Bachelor of Computer Applications **(CTIS):** *Approved in 2ⁿᵈ meeting of Academic Council held on 28.06.2025.*

2. Shanti Narayan and P K Mittal, *Differential Calculus*, Sultan Chand & Co.
3. J. V. Dyke, J. Rogers and H. Adams, *Fundamentals of Mathematics*, Cengage Learning

Course Code	Course Title	L	T	P	Credits
ASH-HUM-107A	Universal Human Values (Pre-requisite: None)	2	0	0	2
		CIE	SEE	Total	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

ASH-HUM-107A.1	Understand the importance of value, types and roles of values in personal and societal development.
ASH-HUM-107A.2	Understand and apply principles of inner harmony to enhance overall well-being and foster balanced personal development
ASH-HUM-107A.3	Understand principles of harmonious relationships to promote unity and cooperation within families, society and nature.
ASH-HUM-107A.4	Understand the difference between ethical and unethical practices

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
ASH-HUM-107A.1	2	-	2	-	2	-	-	2	-	2
ASH-HUM-107A.2	-	-	-	-	2	-	-	2	-	-
ASH-HUM-107A.3	-	-	2	-	3	2	3	2	-	-
ASH-HUM-107A.4	-	-	2	-	-	-	3	2	-	2

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

UNIT-I   **Contact Hours: 7**

Introduction to Value Education

Value Education - Definition, concept and need, the content and process of value education, basic guidelines for value education, self-exploration as a means of value education, happiness and prosperity as parts of value education.

UNIT-II   **Contact Hours: 8**

Harmony in the Human Being

Human being is more than just the body, harmony of the self ('I') with the body, understanding myself as co-existence of the self and the body, understanding needs of the self and the needs of the body, understanding the activities in the self and the activities in the body.

UNIT-III   **Contact Hours: 8**

Harmony in the Family and Nature

Harmony in the Family: Family as a basic unit of human interaction and values in relationships; The basics for respect and today's crisis: affection, guidance, reverence, glory, gratitude and love; Comprehensive human goal: the five dimensions of human endeavor;
Harmony in Nature: the four orders in nature, the holistic perception of harmony in existence.

UNIT-IV   **Contact Hours: 7**

Social and Professional Ethics

Social and Professional Ethics: The basics for ethical human conduct, defects in ethical human conduct, holistic alternative and universal order, universal human order and ethical conduct. Value based life and profession, professional ethics and right understanding, competence in professional ethics; Issues in professional ethics – the current scenario.

Practice Sessions:
Bachelor of Computer Applications (CTIS): Approved in 2nd meeting of Academic Council held on 28.06.2025.

Unit-1
- To discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

Unit-2
- To discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation.

Unit-3
- To reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives. To discuss human being as cause of imbalance in nature.

Unit-4
- To explore ethical human conduct and steps of transition towards universal human order.

Text Books:
1. A. N. Triparty, *Human Values,* New Age International Publishers
2. Bajpai, B. L., *Human Values and Professional Ethics*, New Royal Book Co, Lucknow, Reprinted

Other References:
1. Gaur. R. R., Sangal R., Bagaria. G. P., *A Foundation Course in Value Education*, Excel Books
2. I. C. Sharma. *Ethical Philosophy of India*, Nagin & Co., Jalandhar

Course Code	Course Title	L	T	P	Credits
ASH-HUM-118A	**English Language and Communication-2** (Pre-requisite: English Language and Communication-1)	2	0	0	2
		CIE	**SEE**	**Total**	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

ASH-HUM-118A.1	Understand the basic concepts of English Grammar.
ASH-HUM-118A.2	Use appropriate reading skills in professional communication.
ASH-HUM-118A.3	Use appropriate writing styles in professional communication.
ASH-HUM-118A.4	Apply interview and presentation skills.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
ASH-HUM-118A.1	2	2	-	-	2	2	2	2	-	2
ASH-HUM-118A.2	2	3	2	2	2	-	2	2	-	-
ASH-HUM-118A.3	2	2	2	2	3	2	2	3	-	-
ASH-HUM-118A.4	2	3	2	2	3	2	3	2	-	2

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

<div align="center">

UNIT-I   **Contact Hours: 8**

</div>

Basic Language Skills:

Basic Language Skills: Parts of Speech, Subject-Verb agreement, Articles, Transformation of Sentences (Simple, Compound, Complex) and Tenses..

<div align="center">

UNIT-II   **Contact Hours: 7**

</div>

Reading Skills

Reading Skills: Reading with fluency and speed, Skimming and scanning, Identifying relevant information, Isolating fact from opinion, Understanding concepts and arguments, Identifying distinctive features of language (Passage should be of 250-350 words of Level I. The passage may be taken from literary/scientific/technical writing as well as from the fields of journalism, management and commerce.)

<div align="center">

UNIT-III   **Contact Hours: 8**

</div>

Writing Skills

Writing Skills (Formal Correspondence): Letters, Job Application Letter, Statement of Purpose, Request for Recommendation Letter, Request for information under Right to Information Act (RTI)
Writing Skills: Essay, Expository, Persuasive, Analytical and Reflective/Descriptive

<div align="center">

UNIT-IV   **Contact Hours: 7**

</div>

Interview and Presentation skills

Interview Skills: Purpose of an interview, Do's and Don'ts of an interview
Giving Presentations: Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery

Text Books:
1. Bellare, Nirmala. *Reading Strategies. Vols. 1 and 2.* New Delhi. Oxford University Press.
2. Brown, Ralph, *Making Business Writing Happen: A Simple and Effective Guide to Writing Well,* Allen and Unwin, Sydney.

Bachelor of Computer Applications (CTIS): Approved in 2nd meeting of Academic Council held on 28.06.2025.

3. Hamp-Lyons, Liz and Ben Heasiey, *Study Writing: A Course in Writing Skills for Academic Purposes*, Cambridge University Presss

Reference Books:
1. Jakeman, Vanessa and Clare McDowell. *Cambridge Practice Test for IELTS 1*, Cambridge University Presss.
2. Mohan Krishna and Banerji, Meera, *Developing Communication Skills,* Macmillan India, New Delhi
3. Mohan Krishna and Singh, N. P., *Speaking English Effectively*, Macmillan India, New Delhi.
4. Savage, Alice, *Effective Academic Writing,* Oxford University Press.

Webliography:
1. https://www.onestopenglish.com/
2. https://www.britishcouncil.org/learning-learn-english.htm
3. http://www.teachingeng1ish.org.uk
4. https://www.usingenglish.com?
5. https://www.bbc.co.uk/
6. https://www.pearsoned.co.uk/AboutUs/ELT/
7. https://www.howisay.com/
8. https://www.thefreedictionary.com/
9. Online English Grammar Book | ENGLISH PAGE

Course Code	Course Title	L	T	P	Credits
ASH-HUM-119A	**Indian Knowledge System** (Pre-requisite: None)	2	0	0	2
		CIE	SEE	Total	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

ASH-HUM-119A.1	Identify the concept and importance of Traditional knowledge.
ASH-HUM-119A.2	Illustrate the various enactments related to the protection of traditional knowledge.
ASH-HUM-119A.3	Interpret the concepts of Intellectual property to protect the traditional knowledge.
ASH-HUM-119A.4	Explain the importance of Traditional knowledge in Agriculture and Medicine.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
ASH-HUM-119A.1	-	2	2	-	-	1	3	2	-	-
ASH-HUM-119A.2	-	2	2	-	-	1	3	2	-	-
ASH-HUM-119A.3	-	2	2	-	2	2	3	2	-	-
ASH-HUM-119A.4	-	2	3	-	2	2	3	2	-	-

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

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UNIT-I   **Contact Hours: 8**
</div>

Introduction and Protection to Traditional Knowledge

Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge versus western knowledge traditional knowledge.
The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

<div align="center">

UNIT-II   **Contact Hours: 7**
</div>

Legal framework and Traditional Knowledge

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill.

<div align="center">

UNIT-III   **Contact Hours: 8**
</div>

Traditional knowledge and intellectual property

Traditional knowledge and intellectual property**:** Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge

<div align="center">

UNIT-IV   **Contact Hours: 7**
</div>

Traditional Knowledge in Different Sectors

Traditional Knowledge in Different Sectors**:** Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK

Text Books:

Bachelor of Computer Applications (CTIS): Approved in 2nd meeting of Academic Council held on 28.06.2025.

1. Amit Jha, *Traditional Knowledge System in India*, Atlantic publishers, 2002.
2. Kapil Kapoor, Michel Danino, *Knowledge Traditions and Practices of India,* Central Board of Secondary Education, Delhi
3. Dr. Rohidas Nitonde, *Introduction to Indian Knowledge System: A Textbook for UG Students as per NEP 2020,* Notion Press

Reference Books:
1. B. Mahadevan, Vinayak Rajat Bhat, and Nagendra Pavana R.N.*, Introduction to Indian Knowledge System: Concepts and Applications*, PHI Learning

Online Videos Tutorials:
1. https://www.youtube.com/watch?v=LZP1StpYEPM

2. http://nptel.ac.in/courses/121106003/

Bachelor of Computer Applications
(Cloud Technology and Information Security)
Semester–III

Course Code	Course Title	L	T	P	Credits
BCA-201A	**Software Engineering** (Pre-requisite: None)	3	0	0	3
		CIE	**SEE**	**Total**	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to	
BCA-201A.1	Understand the fundamental concepts and need of software engineering principles in software product development.
BCA-201A.2	Analyze the phases of software development life cycle, requirements analysis and specification using appropriate tools and techniques.
BCA-201A.3	Apply software design principles to create structured and maintainable software products.
BCA-201A.4	Evaluate software quality using metrics and implement testing to ensure reliable software products.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-201A.1	3	-	-	-	-	-	-	2	2	2
BCA-201A.2	3	3	2	3	2	2	-	2	2	2
BCA-201A.3	3	2	3	3	3	2	-	2	3	2
BCA-201A.4	3	2	3	3	3	2	2	3	2	3

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

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UNIT-I   **Contact Hours: 10**

</div>

Introduction to Software Engineering

Introduction: Software, Program, Software Crisis and Solutions, Software Evolution, Software Development Paradigm, Need of Software Engineering, Software Processes, Software Characteristics, Attributes of Software Product, Software Myths, Software basic terminologies, Characteristics of good software.

<div align="center">

UNIT-II   **Contact Hours: 13**

</div>

Software life cycle, Requirements Analysis and Specifications

Software life cycle models: Build and Fix, Waterfall, Prototype, Iterative Enhancement, Evolutionary Development Model, Prototyping, and Spiral Model.

Software Requirements Analysis and Specifications: Types of Requirements. Requirement Elicitation: Interview, Brainstorming, Quality Functional Deployment, Use Case Approach. Problem Analysis – DFD, Data dictionaries, ER diagrams, object diagrams, approaches to problems analysis, SRS, specifying behavioural & non-behavioural requirements.

<div align="center">

UNIT-III   **Contact Hours: 12**

</div>

Software Design

Software Design: Design framework, Conceptual and Technical Design, Trade-off between modularity and software cost, Cohesion and Coupling, Types of cohesion and coupling, Object oriented Design, Function Oriented Design.

<div align="center">

UNIT-IV   **Contact Hours: 10**

</div>

Software Metrics and Testing

Software Metrics: Definition, Categories of metrics, Token Count, Data Structure Metrics.

Software Testing: Introduction, difference between Bug, Mistake, error, Fault and Failure, Alpha, Beta and Acceptance

Testing, Levels of Testing..

Text Books:
1. K. K. Aggarwal and Yogesh Singh, *Software Engineering*, New Age International Private Limited; Fourth edition.
2. Pankaj Jalote, *An Integrated Approach to Software Engineering*, Narosa Publications

Reference Books:
1. Richard Fairley, *Software Engineering Concepts*, McGraw Hill Education.
2. R. S. Pressman, *Software Engineering – A practitioner's approach*, , McGraw Hill

NOTE:
1. For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 5-7 short answer type questions, will be compulsory and based on the entire syllabus. Rest of the eight questions is to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit AND Question no. 1. All questions will carry equal marks.

2. The students will be allowed to use non-programmable scientific calculator. However, sharing / ex-change of calculator or any other items are prohibited in the examinations. No programmable calculators, mobile phones or other electrical/ electronic items are allowed in the examination.

Course Code	Course Title	L	T	P	Credits
BCA-211A	**Linux and Shell Programming** (Pre-requisite: None)	3	0	0	3
		CIE	SEE	Total	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-211A.1	Understand the architecture, features, and basic commands of Linux operating system.
BCA-211A.2	Apply file permission and process management commands.
BCA-211A.3	Apply shell scripting to automate tasks using structured control flow.
BCA-211A.4	Configure and maintain file systems and authentication for secure and efficient system management.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-211A.1	3	-	-	2	-	-	-	2	-	2
BCA-211A.2	3	2	2	2	2	2	-	2	2	3
BCA-211A.3	3	2	2	2	-	-	-	2	-	2
BCA-211A.4	3	2	3	3	2	3	2	2	2	3

Instructions for Paper Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

<div align="center">UNIT-I   Contact Hours: 10</div>

Linux operating system and basic commands

Introduction to Linux and Linux Utilities: A brief history of LINUX, architecture of LINUX, features of LINUX, Introduction to vi editor.

Linux Commands: - General Purpose commands (PATH, man, echo, printf, script, passwd, uname, who, date, stty etc.), File Oriented Commands (cat, tail, head, join, tee, pg, comm, cmp, diff, tr, more, wc, lp, od, ls, cp, mv, rm etc.), Directory Oriented Commands (pwd, cd, mkdir, rmdir, ls)

<div align="center">UNIT-II   Contact Hours: 12</div>

File permissions, process, and disk related commands

File access permissions: chmod, umask, chgrp, groups i.e checking permissions, changing ownership, groups and permissions of files.

Manipulating Processes and Signals: Basics, process states and transitions, zombie and orphan processes, process-oriented commands. Handling foreground and background jobs. Process scheduling using cron, crontab, at, batch. Changing priority. Signal generation and Handling.

Disk related commands: dd, du, df, dfspace, fdisk, compressing and uncompressing files.

<div align="center">UNIT-III   Contact Hours: 13</div>

Shell Scripting, filters and pipes

Shell Scripting: Introduction of Bash shell, Bash Features, Command Line, Command Line Expansion, and Editing, Scripting Basics, Creating Shell Scripts, Handling Input/ Output, Control Structures, Conditional Execution, File and string Tests, continue and break, Using positional parameters, Scripting at the command line, Shell Script debugging.

Filters: Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count Characters, Words or Lines, Comparing Files.

<div align="center">UNIT-IV   Contact Hours: 10</div>

File system and user account management

File System: Introduction to files, Organization, Assessing File systems, Structure - boot block, super block, inode block,

data block. Creating, mounting and unmounting file systems. Shutting down of system, init command.
Managing User accounts: creating, modifying & deleting user accounts and groups

Text Books:
1. Harwani B.M., *Unix and Shell Programming*, Oxford University Press.
2. Goerzen John, *Linux Programming Bible*, IDG Books, New Delhi.
3. Das Sumitabha, *You UNIX – The Ultimate Guide*, Tata McGraw Hill

Reference Books:
1. Matthew Neil, Stones Richard, *Beginning Linux Programming*, Wiley India Pvt. Ltd.
2. Christopher Negus, *Linux Bible*, Wiley India Pvt. Ltd.
3. Richard Peterson, *Linux – The Complete Reference*, Tata McGraw Hill

NOTE:
1. For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 5-7 short answer type questions, will be compulsory and based on the entire syllabus. Rest of the eight questions is to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit AND Question no. 1. All questions will carry equal marks.

2. The students will be allowed to use non-programmable scientific calculator. However, sharing / ex-change of calculator or any other items are prohibited in the examinations. No programmable calculators, mobile phones or other electrical/ electronic items are allowed in the examination.

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Course Code	Course Title	L	T	P	Credits
		0	0	4	2
BCA-281A	**Linux and Shell Programming Lab** (Pre-requisite: Linux)	**CIE**	**SEE**	**Total**	
		50	50	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-281A.1	Demonstrate the use of basic Linux commands to manage files, users, and system configurations.
BCA-281A.2	Develop and debug shell scripts using control structures and utilities for task automation.
BCA-281A.3	Implement file handling, text processing, and permission management through custom shell scripts.
BCA-281A.4	Execute file operations and permissions using shell scripting.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-281A.1	3	-	-	2	-	-	-	2	-	2
BCA-281A.2	3	2	2	2	2	2	-	2	2	3
BCA-281A.3	3	2	2	2	-	-	-	2	-	2
BCA-281A.4	3	2	3	3	2	3	2	2	2	3

List of Experiments	
No.	**Experiment Detail**
1.	Write shell script to show various system configurations like (i) Currently logged user and his long name (ii) Current shell (iii) Your home directory (iv) Your operating system type (v) Your current path setting (vi) Your current working directory (vii) Show all available shells
2.	Write a shell script that accept a file name starting and ending line numbers as arguments and display all the lines between given line no.
3.	Write a shell script to count the number of words in a file without using in-built commands.
4.	Write a shell script to copy a file to another directory with using relative paths.
5.	Write a shell script to find all files with write permissions at user level, add execute permission also to such files.
6.	Write a shell script to make a file execute at particular time using at command.
7.	Write a script to perform following basic math operations as (i) Addition (ii) Subtraction (iii) Multiplication (iv) Division Note: i) Take input from keyboard. ii) Take input from command line arguments
8.	Write a shell script to find factorial of a number.

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9.	Write a shell script to find Fibonacci series.
10.	Write a shell script to read a file name from user, check whether the file exist in directory or not. If yes, then append the content into file. If not then, create file and append the content into the file.
11.	Write a shell script to convert upper case characters in a file to lower case and vice versa.
12.	Write a shell script to compare two files, sort and find duplicate records in the file.

Text Books:
1. Harwani B.M., *Unix and Shell Programming*, Oxford University Press.
2. Goerzen John, *Linux Programming Bible*, IDG Books, New Delhi.
3. Das Sumitabha, *You UNIX – The Ultimate Guide*, Tata McGraw Hill

Reference Books:
1. Matthew Neil, Stones Richard, *Beginning Linux Programming*, Wiley India Pvt. Ltd.
2. Christopher Negus, *Linux Bible*, Wiley India Pvt. Ltd.
3. Richard Peterson, *Linux – The Complete Reference*, Tata McGraw Hill

Course Code	Course Title	L	T	P	Credits
BCA-203A	Database Management System (Pre-requisite: None)	3	0	0	3
		CIE	SEE	Total	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-203A.1	Understand the fundamentals of DBMS, data models, schema architecture, and ER/EER design.
BCA-203A.2	Apply SQL and PL/SQL concepts to create, query, and manage relational databases.
BCA-203A.3	Understand normal forms and functional dependencies and apply normalization to database schemas.
BCA-203A.4	Analyze transaction processing, concurrency control, and data warehousing concepts.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-203A.1	3	3	3	2	2	-	-	1	2	2
BCA-203A.2	3	2	2	3	2	2	-	2	3	3
BCA-203A.3	3	2	2	2	2	2	-	2	-	2
BCA-203A.4	3	3	2	3	2	-	-	2	3	3

Course Contents:

<center>UNIT-I   Contact Hours: 11</center>

Database and Database Management System

Introduction and need of Database and Database Management System (DBMS). Characteristics of DBMS, Database Users, Data Models, Schema, and Instances. Three-Schema architecture and data Independence.

Database Design using ER model: Entity types, Entity set, attributes and Keys. Relationship types. Expressing M:N relation. Enhanced Entity Relationship Model (EER): Specialization, Generalization, Attribute inheritance and Aggregation

<center>UNIT-II   Contact Hours: 12</center>

Relational model and Relational Algebra

Relational model concepts. Introduction to SQL, Types of SQL commands (DDL, DML, and DCL etc),SQL operators and their procedure, views and indexes. Queries and sub queries, Group by and Having clause, Aggregate functions and Constraints. PL/SQL: Architecture of PL/SQL, Basic Elements of PL/SQL.

Relational Algebra: Introduction of Relational Algebra, Selection and projection. Renaming, Joins, Unions, Intersection, Cartesian product and Division.

<center>UNIT-III   Contact Hours: 10</center>

Normalization

Need for Normalization, anomalies (insert, delete and update), Functional Dependencies, Minimal set of Functional Dependencies, Normal Forms: 1NF, 2NF, 3NF. Higher Level Normal Forms: Boyce/ Codd Normal Form, multi-valued dependency (MVD), Fourth Normal Form, Join dependencies and Fifth Normal Form.

<center>UNIT-IV   Contact Hours: 12</center>

Transaction processing, Overview of data mining and warehousing

Transaction Processing Concepts: Transaction and Schedules, transaction properties, concurrent execution of transaction, Conflict and View serializability, testing for serializability, concepts in Recoverable and Cascadeless schedules.Concurrency Control Techniques: Lock based protocols, Two phase locking technique, time stamp based protocols, validation based protocols.

Overview of data mining technology, Introduction of data warehousing, Characteristics of data warehouses.

Text Books:

1. Ramez Elmasri and Shamkant B. Navathe, *Fundamentals of Database Systems*, Pearson
2. Ivan Bayross, *SQL, PL/SQL the Programming Language of Oracle,* BPB

Reference Books:

1. Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems,* McGraw Hill
2. Markus Winand, *SQL Performance Explained,* Self Publishing
3. Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, *Database System Concepts,* McGraw Hill

NOTE:
1. For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 5-7 short answer type questions, will be compulsory and based on the entire syllabus. Rest of the eight questions is to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit AND Question no. 1. All questions will carry equal marks.

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Bachelor of Computer Applications (CTIS): Approved in 2ⁿᵈ meeting of Academic Council held on 28.06.2025.

Course Code	Course Title	L	T	P	Credits
BCA-273A	**Database Management System Lab** (Pre-requisite: DBMS, PL/SQL)	0	0	4	2
		CIE	SEE	Total	
		50	50	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-273A.1	Understand the fundamentals of ER design and map to relational model.
BCA-273A.2	Apply SQL and PL/SQL concepts to create, query, and manage relational databases.
BCA-273A.3	Perform pattern matching and other operations
BCA-273A.4	Implement selection, loop, exception, normalization and transaction processing concept in database using PL/SQL.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-273A.1	3	3	3	2	2	-	1	-	2	2
BCA-273A.2	3	2	2	2	2	2	-	-	3	3
BCA-273A.3	3	2	3	2	2	-	1	2	-	2
BCA-273A.4	2	3	2	3	3	2	-	2	3	3

List of Experiments	
No.	**Experiment Detail**
1.	Design an ER diagram for a college database with students, departments, and courses.
2.	Convert the ER diagram into relational schema and identify primary, foreign keys.
3.	Create tables in a relational DBMS using SQL based on the ER schema.
4.	Execute basic SQL commands: DDL, DML, DCL on a sample database
5.	Demonstrate the use of Data Constraints.
6.	Write SQL queries using WHERE, BETWEEN, LIKE, IN, and ORDER BY.
7.	Use aggregate functions with GROUP BY and HAVING clauses.
8.	Demonstrate pattern matching and range searching functions.
9.	Demonstrate the use of ORACLE operators • Arithmetic operators • Comparison operators • Logical operators
10.	Demonstrate the use of DUAL table
11.	Demonstrate the use of INDEX in DBMS
12.	Perform different types of joins (INNER, OUTER).
13.	Write PL/SQL programs using variables, IF-THEN, loops, and exceptions.
14.	Identify anomalies and perform step-by-step normalization (1NF to 3NF) on a sample unnormalized relation.
15.	Demonstrate the concept of locking using a small transaction simulation.

Text Books:

Bachelor of Computer Applications (CTIS): Approved in 2ⁿᵈ meeting of Academic Council held on 28.06.2025.

1. Ramez Elmasri and Shamkant B. Navathe, *Fundamentals of Database Systems*, Pearson
2. Ivan Bayross, *SQL, PL/SQL the Programming Language of Oracle,* BPB

Reference Books:

1. Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems,* McGraw Hill
2. Markus Winand, *SQL Performance Explained,* Self Publishing
3. Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, *Database System Concepts,* McGraw Hill

Bachelor of Computer Applications (CTIS): Approved in 2nd meeting of Academic Council held on 28.06.2025.

Course Code	Course Title	L	T	P	Credits
BCA-213A	**Introduction to Information Security** (Pre-requisite: None)	2	0	0	2
		CIE	SEE	Total	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-213A.1	Understand the fundamental principles of information security.
BCA-213A.2	Learn cryptographic techniques and authentication mechanisms to ensure data confidentiality, integrity, and access control in secure systems.
BCA-213A.3	Analyze network security threats and implement protective technologies such as firewalls, IDS/IPS
BCA-213A.4	understand the concepts of operating systems and web securities

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-213A.1	3	2	-	2	-	-	2	2	-	2
BCA-213A.2	3	3	2	2	-	2	3	2	2	3
BCA-213A.3	3	3	3	3	2	-	3	2	2	3
BCA-213A.4	2	2	2	3	2	-	3	3	2	3

Course Contents:

UNIT-I   **Contact Hours: 8**

Information Security Concepts

Information Security Concepts: Information security issues, goals of information security (CIA triad: Confidentiality, Integrity, Availability), architecture, Attacks, Security Services and Mechanisms.
Overview of Security threats and Vulnerability: Types of attacks on Confidentiality, Integrity and Availability. Vulnerability and Threats..

UNIT-II   **Contact Hours: 7**

Cryptography, Authentication and Access Control

Introduction to Cryptography: Network security model, Cryptographic systems, Cryptanalysis, Steganography.
Types of Cryptography: Symmetric key and Asymmetric Key Cryptography, Encryption and Decryption Techniques.
Authentication and Access Control: Authentication methods (passwords, biometrics, multi-factor), and access control models (DAC, MAC, RBAC).

UNIT-III   **Contact Hours: 8**

Network and Software Security

Network Security Model, Network Security Threats, Firewalls: Overview, Types, Features, User Management, Intrusion Detection System , Intrusion Prevention System,
Secure Software Development: Secure coding practices, common vulnerabilities (SQL injection, XSS), and secure software development lifecycle (SDLC).

UNIT-IV   **Contact Hours: 7**

Operating System and Web Security

Operating System Security: Designing Secure Operating Systems, OS Security Vulnerabilities, patch management, and system hardening.
Email security: PGP and SMIME,
Web Security: Web security threats, Web authentication, Injection Flaws, SQL Injection, secure web application development, and common web security tools, Web Browser Security.

Bachelor of Computer Applications (CTIS): Approved in 2ⁿᵈ meeting of Academic Council held on 28.06.2025.

Text Books:
1. Michael E. Whitman, Herbert J. Mattrod , *Principles of Information Securtiy*, Mindtap.
2. Sanil Nandkarni , *Fundamentals of Information Securtiy*, BPB Publications.

Reference Books:
1. Glen Sagers, Bryan Hosack, *Information Technology Security Fundamentals*, Business Expert Press
2. David Kim, Michael G. Solomon, *Fundamentals Of Information Systems Security,* Jones and Bartlett Publishers, Inc.

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*Bachelor of Computer Applications (**CTIS**): Approved in 2nd meeting of Academic Council held on 28.06.2025.*

Course Code	Course Title	L	T	P	Credits
BCA-215A	**Full Stack Development-I (MERN)** (Pre-requisite: Web Technology (HTML, CSS, JavaScript))	3	0	0	3
		CIE	**SEE**	**Total**	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-215A.1	Understand the core concepts of the MERN stack, including React.js, Express.js, Node.js, and MongoDB.
BCA-215A.2	Develop front-end applications using React.js, including state management and component-based architecture.
BCA-215A.3	Build RESTful APIs with Express.js and integrate MongoDB for backend data storage and retrieval.
BCA-215A.4	Implement authentication, middleware, and deployment techniques for full-stack applications.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-215A.1	3	-	-	2	-	-	-	2	2	2
BCA-215A.2	3	-	2	3	2	2	-	2	2	-
BCA-215A.3	3	3	3	3	2	3	2	3	3	2
BCA-215A.4	3	3	3	3	3	3	-	3	3	3

Course Contents:

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UNIT-I   **Contact Hours: 12**

</div>

Introduction to MERN Stack & Node.js

Overview of Full Stack Development and MERN Stack.Node.js: Introduction, history, features, and its role in MERN. Comparison between JavaScript Client-side vs. Server-side programming. Installation of Node.js and npm, writing and executing basic scripts. Understanding JavaScript fundamentals: Variables, functions, loops, and arrays. Event-driven architecture and the Node.js runtime environment.

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UNIT-II   **Contact Hours: 11**

</div>

Frontend Development with React.js basics

React.js Introduction: Why React? Virtual DOM, React Setup (Create React App). JSX & Components: Functional vs. Class Components, Props, State. React Hooks: useState, useEffect, useContext, handling side effects. Event Handling & Forms: Controlled vs. Uncontrolled components. React Router: Navigation, dynamic routing, route parameters. State Management in React: Context API, Prop Drilling, Lifting State Up.

<div align="center">

UNIT-III   **Contact Hours: 12**

</div>

Backend Development with Node.js & Express.js

Node.js Modules: Core modules, global modules, and user-defined modules.Express.js: Introduction, routing, request handling, middleware. Template Engines (EJS) for rendering dynamic web pages. Middleware: Introduction to Express.js middleware and error handling. Database Integration: Introduction to MongoDB, performing CRUD operations with Mongoose. Using Postman for API testing.

<div align="center">

UNIT-IV   **Contact Hours: 10**

</div>

Advanced Concepts and Deployment

Asynchronous Programming: Callback, Promises, Async/Await, Event loop in Node.js. Mongoose ORM: Schema and model creation, advanced queries. Authentication & Authorization: JSON Web Tokens (JWT), bcrypt, Role-based authentication. State Management in React: Context API, Redux basics. File Handling & APIs: Using `multer` for file uploads, building Search APIs. Deployment: Hosting MERN applications using services like Vercel, Netlify, and AWS.

Text Books:
1. Basarat Ali Syed, *Beginning Node.js*, Apress.
2. Adam Boduch, Roy Derks, *React and React Native*, Packt Publishing.
3. Ethan Brown, *Learning JavaScript Design Patterns*, O'Reilly.

Bachelor of Computer Applications (CTIS): Approved in 2ⁿᵈ meeting of Academic Council held on 28.06.2025.

4. Vasan Subramanian, *Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node,* Apress, 2019.

Reference Books:
1. Boronczyk, Naramore, *Beginning PHP, Apache, MySQL Web Development*, Wiley India Pvt.Ltd.
2. Kyle Simpson, *You Don't Know JS: Up and Going*, O'Reilly.
3. David Flanagan, *JavaScript: The Definitive Guide*, O'Reilly Media.
4. Simon Holmes, Clive Harber, *Getting MEAN with Mongo, Express, Angular, and Node*, Manning Publications.

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Course Code	Course Title	L	T	P	Credits
BCA-283A	**Full Stack Development-I (MERN) Lab** (Pre-requisite: MERN Stack)	0	0	4	2
		CIE	**SEE**	**Total**	
		50	50	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-283A.1	Implement Node.js applications
BCA-283A.2	Write programs implementing Express.js
BCA-283A.3	Write programs implementing React.js
BCA-283A.4	Deploy a Full stack development application

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-283A.1	3	-	-	2	2	-	-	2	2	2
BCA-283A.2	3	2	2	2	2	2	-	3	2	-
BCA-283A.3	3	2	2	3	3	2	-	3	3	3
BCA-283A.4	3	3	3	3	3	3	-	3	3	3

List of Experiments	
No.	**Experiment Detail**
1.	Write a simple 'Hello World' program in Node.js.
2.	Create a Node.js script that reads and writes files using the `fs` module.
3.	Build a basic Express.js server with different routes.
4.	Implement middleware in Express.js for logging request details.
5.	Create a RESTful API in Express.js to perform CRUD operations on a MongoDB database.
6.	Implement authentication using JWT in an Express.js application.
7.	Upload and retrieve files/images using `multer` in Express.js.
8.	Set up a basic React application and create a functional component.
9.	Implement React state and props in a simple To-Do List app.
10.	Build a multi-page React app using React Router.
11.	Fetch data from an API and display it using React (Axios or Fetch API).
12.	Implement global state management using the Context API in React.
13.	Implement form validation and handle user input in React.
14.	Connect a React frontend with a Node.js/Express backend using Axios.
15.	Deploy a full-stack MERN application (frontend + backend) using Vercel and Netlify.

Text Books:
1. Basarat Ali Syed, *Beginning Node.js*, Apress.
2. Adam Boduch, Roy Derks, *React and React Native*, Packt Publishing.
3. Ethan Brown, *Learning JavaScript Design Patterns*, O'Reilly.

Bachelor of Computer Applications (CTIS): Approved in 2nd meeting of Academic Council held on 28.06.2025.

4. Vasan Subramanian, *Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node,* Apress, 2019.

Reference Books:
1. Boronczyk, Naramore, *Beginning PHP, Apache, MySQL Web Development*, Wiley India Pvt.Ltd.
2. Kyle Simpson, *You Don't Know JS: Up and Going*, O'Reilly.
3. David Flanagan, *JavaScript: The Definitive Guide*, O'Reilly Media.
4. Simon Holmes, Clive Harber, *Getting MEAN with Mongo, Express, Angular, and Node*, Manning Publications.

Syllabus of the Courses offered by other Departments for
Bachelor of Computer Applications (CTIS)
Semester –III

Course Code	Course Title	L	T	P	Credits
BBA-217A	**Personality Development**	2	0	0	2
		CIE	SEE		Total
		40	60		100

Course Outcomes

CO1	To understand the various aspects of personality development.
CO2	To learn the importance of positive attitude.
CO3	To build the employability quotient among students.
CO4	To understand the techniques of self-management.

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	1	-	-	3	-	-	-	2	-	-
CO2	2	1	-	2	-	-	-	3	1	2
CO3	2	1	2	3	2	-	-	2	2	2
CO4	3	2	-	2	1	3	3	3	2	2

Course Outline

Unit Number: 1	**Introduction to Personality Development**	Contact Hours:7
Personality Development: Motivation, Positive Attitude and Confidence Building Techniques; Personal Grooming and Hygiene: Defining Strengths, Formal and Informal Presentation of Self, Situational Conversations, Teamwork and Collaboration, Conflict Resolution, Networking Skills		
Unit Number: 2	**Attitude & Motivation**	Contact Hours:8
Attitude - Concept - Significance - Factors affecting attitudes - Positive attitude – Advantages –Negative attitude- Disadvantages - Ways to develop positive attitude - Differences between personalities having positive and negative attitude. Concept of motivation - Significance – Internal and external motives - Importance of self- motivation- Factors leading to de-motivation		
Unit Number: 3	**Employability Quotient**	Contact Hours:7
Resume building- The art of participating in Group Discussion – Facing the Personal (HR & Technical) Interview -Frequently Asked Questions - Psychometric Analysis - Mock Interview Sessions.		
Unit Number: 4	**Other Aspects of Personality Development**	Contact Hours:8
Body language - Problem-solving - Conflict and Stress Management - Decision-making skills - Leadership and qualities of a successful leader – Character building -Team-work – Time management - Work ethics – Good manners and etiquette.		

Text Books:
1. Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill.
2. Stephen P. Robbins and Timothy A. Judge (2014), Organizational Behavior 16th Edition: Prentice Hall.

Reference Books
1. Andrews, Sudhir. How to Succeed at Interviews. 21st (rep.) New Delhi. Tata McGraw-Hill 1988.
2. Heller, Robert. Effective leadership. Essential Manager series. Dk Publishing, 2002
3. Hindle, Tim. Reducing Stress. Essential Manager series. Dk Publishing, 2003

Bachelor of Computer Applications
(Cloud Technology and Information Security)
Semester–IV

Course Code	Course Title	L	T	P	Credits
BCA-212A	**Data Communication and Computer Networks** (Pre-requisite: None)	3	0	0	3
		CIE	SEE	Total	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-212A.1	Understand basics of data communication and network models.
BCA-212A.2	Explore network devices, communication types, modulation, switching and multiplexing techniques.
BCA-212A.3	Analyze LAN technologies, IEEE standards, Ethernet types, data link control methods, and MAC protocols.
BCA-212A.4	Explore routing, congestion control, traffic shaping, and network security including encryption and firewalls.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-212A.1	3	2	-	2	2	-	-	2	2	2
BCA-212A.2	3	3	2	3	1	-	-	2	3	2
BCA-212A.3	3	3	2	3	2	-	2	2	3	3
BCA-212A.4	3	2	2	2	2	2	2	2	2	3

Course Contents:

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UNIT-I   **Contact Hours: 11**

</div>

Data Communication and Network Models

Introduction to Data Communications: Components, use and type of computer networks (LAN, MAN, WAN), peer to peer network, client-server model, Transmission modes, Transmission media: guided and unguided, Transmission Impairments, network topologies: bus, ring, star, mesh, tree, hybrid

Network Models: Connection-Oriented & Connectionless Services, OSI model, Layers in OSI model, TCP/IP Protocol Suite, Functions of each layer, Comparison of OSI and TCP/IP.

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UNIT-II   **Contact Hours: 12**

</div>

Network Devices, Analog and Digital Communications, Switching and multiplexing

Network connectivity Devices: connectors, Transceivers, Repeaters, Hubs, Network Interface Cards and PC Cards, Bridges, switches, Routers, Gateways.

Analog and Digital Communications: Analog and digital data and signals, bandwidth and data rate, capacity, baud rate, Modems and modulation techniques.

Switching and multiplexing: circuit, packet and message switching; multiplexing (frequency division, time division and wavelength division)

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UNIT-III   **Contact Hours: 11**

</div>

LAN technologies and Data Link Control

Overview of LAN technologies: IEEE Standards for LAN: 802, VLAN, Bluetooth, Ethernet and types of Ethernets, Token ring, Polling,

Data Link Control: Framing, error detection and correction, sliding window protocols: stop and wait, Go Back N and selective repeat, Media Access Control: ALOHA: pure and slotted ALOHA, CSMA: CSMA/CD and CSMA/CA.

Bachelor of Computer Applications (CTIS): Approved in 2ⁿᵈ meeting of Academic Council held on 28.06.2025.

Routing and Network Security

Routing: Adaptive and Non adaptive routing: Centralised, Distributed, isolated, flooding, random walk, Routing algorithms: Link state, Distance Vector, Congestion Control techniques and Traffic shaping algorithms: leaky bucket and token bucket.

Network Security: Issues, Security attacks, Hacking, Encryption and decryption, cryptography, Digital signatures and certificates, firewalls

Text Books:

1. Behrouz, Forouzan, *Data communication and Networking*, Tata Mc- Graw Hill.

2. Tannenbaum, *Computer Networks,* PHI.

Reference Books:
1. William Stallings, *Data and Computer Communications,* Pearson Education.
2. Comer D., *Computer Networks and Internet, 2nd Edition*, Pearson Education.

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Bachelor of Computer Applications (CTIS): Approved in 2nd meeting of Academic Council held on 28.06.2025.

Course Code	Course Title	L	T	P	Credits
BCA-214A	**Cyber Laws and Ethics** (Pre-requisite: None)	3	0	0	3
		CIE	SEE	Total	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-214A.1	Explain the evolution of cyberspace, forms of cybercrimes, and jurisdictional issues in the context of cyber law.
BCA-214A.2	Acquire knowledge about IT ACT 2000 and its amendments to assess legal recognition of electronic records and digital signatures.
BCA-214A.3	Comprehend the legal and regulatory frameworks governing cyberspace and the dispute resolution mechanism.
BCA-214A.4	Explore the ethical and privacy issues related to cyber laws, and explain the importance of ethics in AI and blockchain contexts.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-214A.1	2	2	-	2	-	-	3	2	2	2
BCA-214A.2	2	3	2	2	-	-	3	2	2	3
BCA-214A.3	2	3	2	2	2	2	3	2	2	3
BCA-214A.4	2	2	2	2	-	2	3	3	2	3

Course Contents:

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UNIT-I   **Contact Hours: 11**

</div>

Introduction to Cyber Laws

Evolution of computer technology, Emergence of cyber space. Computer Crimes and Cyber Crimes, Forms of Cyber Crimes, Cyber Jurisprudence, Cyber Ethics, Cyber Jurisdiction, Civil and criminal jurisdictions, Web space, Web Development agreement, Legal and Technological Significance of Domain Names, Internet as a tool for global access.

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UNIT-II   **Contact Hours: 12**

</div>

IT Act - Key Provisions and Amendments

Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crimes and Offences, Challenges of Prevention and Control of cyber crime, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.

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UNIT-III   **Contact Hours: 12**

</div>

Cyber Law and Related Legislation

Patent Law, Trademark Law, Copyright, Software: Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code
Relevant Sections of the following acts: Indian Evidence Act, Indian Penal Code Bankers Book Evidence Act, Reserve Bank of India Act
Laws Relating to Employees and Internet, Alternative Dispute Resolution, Online Dispute Resolution (ODR).

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UNIT-IV   **Contact Hours: 10**

</div>

Cyber Ethics and Ethical Issues

Cyber Ethics: Importance of Cyber Law, Ethical and privacy issues in cyber law enforcement, Significance of Cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society,
Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics

Text Books:
   1. Craig B, *Cyber Law: The Law of the Internet and Information Technology,* Pearson Education.
Bachelor of Computer Applications (CTIS): Approved in 2ⁿᵈ meeting of Academic Council held on 28.06.2025.

2. Dr Pramod Kr.Singh, *Laws on Cyber Crimes[Along with IT Act and Relevant Rules]* Book Enclave Jaipur India
3. Pawan Duggal, *Cyber Laws*, Universal Law Publishing

Reference Books:

1. K. Kumar, *Cyber Laws: Intellectual property & E Commerce, Security*, Dominant Publisher, 2011.
2. Rodney D. Ryder, *Guide to Cyber Laws*, Second Edition, Wadhwa And Company, New Delhi, 2007.

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Course Code	Course Title	L	T	P	Credits
BCA-216A	**Fundamentals of Storage and Data Centres** (Pre-requisite: None)	3	0	0	3
		CIE	**SEE**	**Total**	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-216A.1	Explain the evolution of storage technology and architecture, and key challenges.
BCA-216A.2	Analyze and compare different RAID levels, their implementation, and impact on disk performance and reliability.
BCA-216A.3	Describe the structure, roles, and application architecture models of data centers.
BCA-216A.4	Explore data center requirements based on industry standards.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-216A.1	3	2	1	2	-	-	3	2	2	2
BCA-216A.2	3	3	2	3	-	-	2	2	3	3
BCA-216A.3	2	2	2	2	2	2	2	3	3	3
BCA-216A.4	2	2	3	2	2	2	3	2	3	3

Course Contents:

UNIT-I Contact Hours: 12

Introduction to Storage Technology and architecture

Introduction to Storage Technology Information storage, evolution of storage technology and architecture, data center infrastructure, key challenges in managing information, information lifecycle. Storage system environments: components of storage system environment, Disk Drive components, Disk Drive Performance, fundamental laws governing disk performance, logical components of the host, application requirements and disk performance.

UNIT-II Contact Hours: 11

Data Protection and Intelligent Storage System

Data Protection: RAID: Implementation of RAID, RAID array components, RAID levels, RAID comparison, RAID Impact on disk performance, host spares. Intelligent Storage System: Components of an Intelligent Storage System, Intelligent Storage array, concepts in Practice: EMC CLARIION and Symmetric.

UNIT-III Contact Hours: 10

Data Centers and Architecture models

Overview of Data Centers: Data Centers Defined, Data Center Goals, Data Center Facilities, Roles of Data Centers in the Enterprise, Roles of Data Centers in the Service Provider Environment, Application Architecture Models. The Client/Server Model and Its Evolution, The n-Tier Model, Multitier Architecture Application Environment, Data Center Architecture.

UNIT-IV Contact Hours: 12

Data Center Requirements

Data Center Requirements: Data Center Prerequisites, Required Physical Area for Equipment and Unoccupied Space, Required Power to Run All the Devices, Required Cooling and HVAC, Required Weight, Required Network Bandwidth, Budget Constraints, Selecting a Geographic Location, Safe from Natural Hazards, Safe from Man-Made Disasters, Availability of Local Technical Talent, Abundant and Inexpensive Utilities Such as Power and Water, Selecting an Existing Building (Retrofitting), tier standard

Text Books:
1. G. Somasundaram, A. Shrivastava, *EMC Corporation : Information Storage and Management*, Wiley publishing
2. Barrie Sosinsky, *Cloud Computing Bible*, Wiley-India

Bachelor of Computer Applications (CTIS): Approved in 2ⁿᵈ meeting of Academic Council held on 28.06.2025.

Reference Books:
1. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, *Cloud Computing: Principles and Paradigms*, Wiley
2. Meeta Gupta, *Storage Area Network Fundamentals*, Pearson Education Limited

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Course Code	Course Title	L	T	P	Credits
BCA-282A	**Storage and Data Centres Lab** (Pre-requisite: Linux)	0	0	4	2
		CIE	**SEE**	**Total**	
		50	50	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-282A.1	Illustrate the evolution of storage devices and analyze disk performance and structure using diagnostic tools and Linux commands.
BCA-282A.2	Implement various RAID levels using open-source tools and design RAID configurations suited to enterprise needs.
BCA-282A.3	Demonstrate understanding of application architecture models and analyze real-world data center designs through case studies.
BCA-282A.4	Design and plan physical and environmental requirements of a data center, including location, rack layout, tier level, and disaster recovery strategies.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-282A.1	3	2	1	2	-	-	3	2	2	2
BCA-282A.2	3	3	2	3	-	-	2	2	3	3
BCA-282A.3	2	2	2	2	2	2	2	3	3	3
BCA-282A.4	2	2	3	2	2	2	3	2	3	3

List of Experiments	
No.	**Experiment Detail**
1.	Study and report the evolution of storage devices (e.g., floppy disks to SSDs).
2.	Identify and compare components of different storage environments (DAS, NAS, SAN).
3.	Simulate disk performance using tools like CrystalDiskMark or Iometer.
4.	Analyze disk structure and read/write speeds using Linux commands (e.g., hdparm, iostat, lsblk).
5.	Prepare a presentation/report on information lifecycle management with case examples.
6.	Simulate RAID levels (0, 1, 5, 10) using open-source tools like mdadm in Linux.
7.	Create a RAID configuration plan for a small enterprise system.
8.	Map application architecture models (2-tier, 3-tier) using diagrams and real-world use cases.
9.	Case study analysis: Google/Amazon/Microsoft data center design and evolution.
10.	Design a rack layout plan for a given number of servers with space and weight constraints.
11.	Create a checklist for selecting a data center location with justification for each criterion.
12.	Calculate and compare the Tier levels of data centers and prepare a summary table.
13.	Create a basic disaster recovery plan for a simulated storage environment.
14.	Use VMware or Virtual Box to set up a multi-OS environment for testing shared storage.

Text Books:
  1. G. Somasundaram, A. Shrivastava, *EMC Corporation : Information Storage and Management*, 1st Edition, Wiley

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2. Barrie Sosinsky, *Cloud Computing Bible*, Wiley-India

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2. Meeta Gupta, *Storage Area Network Fundamentals*, Pearson Education Limited

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Course Code	Course Title	L	T	P	Credits
BCA-202A	**Quantitative Aptitude** (Pre-requisite: Basic math)	2	0	0	2
		CIE	SEE	Total	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-202A.1	Explain the concepts of linear and quadratic equations, and apply them to solve problems involving ages and clocks.
BCA-202A.2	Apply mathematical concepts to solve problems related to time-distance, work-time, and work-wages.
BCA-202A.3	Solve problems related to interest, partnership, sets, and trigonometric ratios.
BCA-202A.4	Apply the concept of measures of central tendencies, permutations and combinations, probability, and data interpretation.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-202A.1	3	-	-	-	-	-	-	2	-	-
BCA-202A.2	3	2	3	-	-	-	-	3	-	-
BCA-202A.3	3	2	3	-	2	-	-	3	-	2
BCA-202A.4	3	2	3	-	-	-	-	3	2	2

Course Contents:

UNIT-I   **Contact Hours: 8**

System of algebraic equations, Ages and Clocks problems

Linear Equations, Quadratic equations, System of algebraic equations in two variables and their applications in simple problems. Problems on ages, Clocks.

UNIT-II   **Contact Hours: 7**

Time and distance, Work and Time problems

Time and distance: Problems based on trains, Boats and Streams, Pipes and Cistern. Work and time: Problems on work and time, work and wages.

UNIT-III   **Contact Hours: 7**

Interest, Partnership, Sets, Height and Distance problems

Simple interest, Compound Interest, Partnership. Basic idea of set theory to solve practical problems. Trigonometric ratios and identities, Height and distance.

UNIT-IV   **Contact Hours: 8**

Permutations and Combinations, Data interpretation

Basic idea of Permutations and Combinations. Events and sample space, Probability. Data interpretation: Raw and grouped data, Bar Graph, Pie Chart, Mean, Median and Mode.

Text Books:
1. R. S. Aggarwal, *Quantitative Aptitude*, S. Chand & Company Limited, New Delhi
2. A. Guha. *Quantitative Aptitude,* 7th Edition, McGraw-Hill Publications

Reference Books:
1. A.S. Tussy, R. D. Gustafson and D. Koenig, *Basic Mathematics for College Students*, Brooks Cole
2. C. C. Pinter, *A Book of Set Theory*, Dover Publications
3. V. Dyke, J. Rogers and H. Adams, *Fundamentals of Mathematics*, Cengage Learning

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Course Code	Course Title	L	T	P	Credits
BCA-218A	**Full Stack Development-II (MEAN)** (Pre-requisite: Web Technology (HTML, CSS, JavaScript))	2	0	0	2
		CIE	SEE	Total	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to	
BCA-218A.1	Understand the core concepts of the MEAN stack, including Angular.js, Express.js, Node.js, and MongoDB.
BCA-218A.2	Understand Directives, Controllers, and Filters in Angular.js
BCA-218A.3	Acquire knowledge about Angular JS Modules and Scope Lifecycle.
BCA-218A.4	Design applications with Node.js, Express.js, and MongoDB

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-218A.1	3	-	-	2	-	-	-	2	2	2
BCA-218A.2	3	-	2	3	2	2	-	2	2	-
BCA-218A.3	3	3	3	3	2	3	2	3	3	2
BCA-218A.4	3	3	3	3	3	3	-	3	3	3

Course Contents:

<div align="center">

UNIT-I   **Contact Hours: 8**
</div>

Introduction to MEAN Stack & Node.js

Overview of Full Stack Development and MEAN Stack.Node.js: Introduction, history, features, and its role in MEAN. Comparison between JavaScript Client-side vs. Server-side programming. Installation of Node.js and npm, writing and executing basic scripts. Understanding JavaScript fundamentals: Variables, functions, loops, and arrays. Event-driven architecture and the Node.js runtime environment.

<div align="center">

UNIT-II   **Contact Hours: 7**
</div>

Introduction to Angular.js

AngularJS - Overview: Need of Angular JS, Applications of Angular JS, Core features, MVC Architecture
Directives: ng-app, ng-init, ng-model, ng-bind, ng-repeat, Directive Lifecycle, Binding Controls to Data, Matching Directives, Angular Expressions
Built in Filters, Using Angular JS Filters. Role of Controller, Controllers and Modules, Nested Controllers, Using Filters in Controllers.

<div align="center">

UNIT-III   **Contact Hours: 7**
</div>

Angular JS Modules and Scope Lifecycle

Introduction to Angular JS Modules, Working with Angular forms, Model Binding Forms, Updating Models with a twist. Scope, Scope Lifecycle, Scope Inheritance, Scope and Controllers, Rootscope, Scope Broadcasting.
Dependency Injection, Creating Services, Factory Service and Provider.

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UNIT-IV   **Contact Hours: 8**
</div>

Application Development with Node.js, Express.js, and MongoDB

Node.js Modules: Core modules, global modules, and user-defined modules.Express.js: Introduction, routing, request handling, middleware. Template Engines (EJS) for rendering dynamic web pages. Middleware: Introduction to Express.js middleware and error handling. Database Integration: Introduction to MongoDB, performing CRUD operations with Mongoose. Using Postman for API testing.

Text Books:
1. Basarat Ali Syed, *Beginning Node.js*, Apress.
2. Ruebbelke L., "*Angular JS in Action"*, Manning Publications

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3. Alex Young, Bradley Meck, Mike Cantelon, Tim Oxley, Marc Harter, T.J. Holowaychuk, Nathan Rajlich , "*Node.js in Action*", Dreamtech Press
4. Ethan Brown, *Learning JavaScript Design Patterns*, O'Reilly.
5. Simon Holmes, Clive Harber, *Getting MEAN with Mongo, Express, Angular, and Node*, Manning Publications.

Reference Books:
1. Kyle Simpson, *You Don't Know JS: Up and Going*, O'Reilly.
2. Seshadri S., Green B., "*Angular JS Up and Running*", O'Reilly
3. David Flanagan, *JavaScript: The Definitive Guide*, O'Reilly Media.
4. Vasan Subramanian, *Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node,* Apress,

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Course Code	Course Title	L	T	P	Credits
BCA-284A	**Full Stack Development-II (MEAN) Lab** (Pre-requisite: MEAN Stack)	0	0	4	2
		CIE	**SEE**	**Total**	
		50	50	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-284A.1	Implement Node.js applications
BCA-284A.2	Write programs implementing Express.js
BCA-284A.3	Write programs implementing Angular.js
BCA-284A.4	Design Applications with Node.js, Express.js, and MongoDB

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-284A.1	3	-	-	2	2	-	-	2	2	2
BCA-284A.2	3	2	2	2	2	2	-	3	2	-
BCA-284A.3	3	2	2	3	3	2	-	3	3	3
BCA-284A.4	3	3	3	3	3	3	-	3	3	3

List of Experiments	
No.	**Experiment Detail**
1.	Write a simple 'Hello World' program in Node.js.
2.	Create a Node.js script that reads and writes files using the `fs` module.
3.	Build a basic Express.js server with different routes.
4.	Implement middleware in Express.js for logging request details.
5.	Create a RESTful API in Express.js to perform CRUD operations on a MongoDB database.
6.	Implement authentication using JWT in an Express.js application.
7.	Upload and retrieve files/images using `multer` in Express.js.
8.	Write program implementing Angular.js directives
9.	Implement Angular.js controllers.
10.	Write program to demonstrate Angular.js Scopes
11.	Write program to demonstrate Angular.js Services
12.	Design an application using Node.js, Express.js, and MongoDB

Text Books:
1. Basarat Ali Syed, *Beginning Node.js*, Apress.
2. Adam Boduch, Roy Derks, *React and React Native*, Packt Publishing.
3. Ethan Brown, *Learning JavaScript Design Patterns*, O'Reilly.
4. Vasan Subramanian, *Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node,* Apress, 2019.

Reference Books:
1. Boronczyk, Naramore, *Beginning PHP, Apache, MySQL Web Development*, Wiley India Pvt.Ltd.

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2. Kyle Simpson, *You Don't Know JS: Up and Going*, O'Reilly.
3. David Flanagan, *JavaScript: The Definitive Guide*, O'Reilly Media.
4. Simon Holmes, Clive Harber, *Getting MEAN with Mongo, Express, Angular, and Node*, Manning Publications.

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Course Code	Course Title	L	T	P	Credits
BCA-256A	**Essentials of Python** (Pre-requisite: None)	3	0	0	3
		CIE	SEE	Total	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-256A.1	Understand the fundamentals of Python programming.
BCA-256A.2	Analyze and implement operators and control structures in Python.
BCA-256A.3	Utilize ordered data objects including string, list and tuple.
BCA-256A.4	Utilize unordered data objects including set and dictionary and design functions.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-256A(i).1	3	2	2	-	-	-	-	2	2	2
BCA-256A(i).2	3	3	3	3	2	2	-	-	2	2
BCA-256A(i).3	3	3	3	3	2	2	-	2	3	3
BCA-256A(i).4	3	3	3	3	2	2	-	2	3	3

Course Contents:

<div align="center">

UNIT-I   **Contact Hours: 9**
</div>

Basics of Python

Overview and applications areas of Python, Python installation, Comments, Keywords, Identifiers, Variables declaration, Standard Data types, id(), type(), quotations for string literals, data type conversion methods, Input/Output statements, escape characters, round( ), importing 'math' package

<div align="center">

UNIT-II   **Contact Hours: 11**
</div>

Operators and Control statements in Python

Operators: Arithmetic, Assignment, Comparison, Logical, Bitwise, Reference or identity (is/ is not), Membership (in /not in)

Control Statements: conditional statements (if, else, elif), loop statements (for, while), break, continue, pass statement.

<div align="center">

UNIT-III   **Contact Hours: 13**
</div>

Ordered Data Objects

Ordered Data Objects: String: declaration, indexing, len(), concatenation, repetition, 'in'/'not in' operator, slice, Traversal, Built-in functions; List: declaration, indexing, len(), creating list using range(), list with initial values, converting string to list, concatenation, repetition, 'in'/'not in' operator, slice, traversal, built-in functions; Tuple: declaration, indexing, len( ), creating tuple using range(), tuple with initial values, converting string to tuple, converting list to tuple, concatenation, repetition, 'in'/'not in' operator, slice, traversal, built-in functions.

<div align="center">

UNIT-IV   **Contact Hours: 12**
</div>

Unordered Data Objects and Functions

Unordered Data Objects: Set: Roster and Rule form, len(), converting list to set and set to list, Built-in functions, Set operations; Dictionary: declaration, len(), inserting and accessing a value, keys(), values(), items(), Built-in functions

Functions: defining a function, calling a function, keyword arguments, default arguments, variable length arguments, scope of variables, Recursive function, map(), Lambda function

Text Books:
1. E. Balagurusamy, *Introduction to Computing and Problem Solving Using Python*, McGrawHill Education
2. Yashavant Kanetkar, Aditya Kanetkar, *Let us Python*, BPB Publications
3. Bob Dowling, *An introduction to Python for absolute beginners*, Cambridge University Press.
4. Vamsi Kurama, *Python Programming: A Modern Approach*, Pearson Education
5. Sheetal Taneja, Naveen Kumar, *Python Programming A Modular Approach*, Pearson
6. Rao R. Nageswara , *Core Python Programming*, Dream Tech, New Delhi

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Reference Books:
1. Mark Lutz, *Learning Python*, 5th edition, O'Reilly.
2. Martin C. Brown, *Python: The Complete Reference*, McGraw-Hill

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Course Code	Course Title	L	T	P	Credits
BCA-286A	**Essentials of Python Lab** (Pre-requisite: Python)	0	0	4	2
		CIE	SEE	Total	
		50	50	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-286A.1	Implement basic Python programs.
BCA-286A.2	Apply operators and control structures in Python.
BCA-286A.3	Design Python programs utilizing ordered data objects.
BCA-286A.4	Design Python programs using unordered data objects and functions.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-286A.1	3	2	3	-	-	-	-	2	2	2
BCA-286A.2	3	3	3	3	2	2	-	3	2	-
BCA-286A.3	3	3	3	3	2	2	-	3	2	2
BCA-286A.4	3	3	2	3	2	2	-	3	2	2

List of Experiments	
No.	**Experiment Detail**
1.	Assume you travel 80 km to and fro in a day. Fuel Cost is INR 80 per liter and your vehicle's Fuel Average is 18 km/litre. Write a Python program to calculate the Driving Cost per day.
2.	Write a program to calculate the area and circumference of a circle for the given radius as input.
3.	Write a program to make use of various Data conversion methods in Python.
4.	Write a Python program which iterates the integers from 1 to 30 (included). if number is divisible by 3 print "PIET", if number is divisible by 5 print "DCA". if number is divisible by both 3 and 5 print "PIET & DCA" and otherwise print the number itself.

5.	Write a Python program to display the following pattern for the given input of no. of lines.
	    1
	   121
	  12321
	 1234321

6.	Write a program to check whether the given integer number is Palindrome or not.
7.	Assuming your weight in kilogram and height in meters, calculate your Body Mass Index (BMI) value using the formula BMI=weight/(height*height) Height is given in (feet.inches) form and weight is given in kgs and to convert total height in meters consider 1 Feet = 0.3048 meter and 1 Inch = 0.0254 meter
8.	Create a list of city names from the given list where city name contains substring 'pur' cities=['Jaipur','Ambala','Nagpur','Kanpur','Karnal','Sholapur']
9.	Wrtie a program to remove leading and trailing blank spaces from string items in the list animals = [' monkey ', ' pitbull dog ', ' rabbit ']

10.	Book order is given as list of sublists with the following items
	
	  Order Number Book Title Author Quantity Unit Price
	  34587 Learning Python Mark Lutz 4 40.95
	  98762 Programming Python Mark Lutz 5 56.80
	  77226 Head First Python Paul Barry 3 32.95

	Write a Python program to generate the Order summary in this List of tuple form [('34587', 163.8), ('98762', 284.0), ('77226', 108.85)] Where first item in the tuple is Order Number, second item is Net Price i.e. Quantity*Unit Price if Net Price < 100.00 it should be increased by Rs. 10.
11.	employees=['Gurpreet','Manjot','Shabadpreet','Gurleen','Vishal','Noor','Navjeet'] gym_members=['Shabadpreet','Vishal','Navjeet'] developers=['Shabadpreet','Gurpreet','Gurleen','Manjot','Navjeet'] From the above given lists write Python program to answer the following queries: i) List all employees who have gym membership and also developers ii) List all the employees who are not either gym members or developers
12.	A string is given to you e.g. "aabaacdaadd". Create a dictionary of each character in the given string and its frequency, i.e. output={'a': 6, 'b': 1, 'c': 1, 'd': 3}

13.	In a shop store, data operator enters Item Name, Quantity sold and its Unit Price one by one till 'CLOSE' is entered. Create Python dictionary of Item Name and its Net Price.
	
	      Sample Input:
	
	      BANANA FRIES 2 20.60
	
	      POTATO CHIPS 3 15.50
	
	      APPLE JUICE 10 100.75
	
	      CANDY 5 2.50
	
	      APPLE JUICE 6 100.75
	
	      CANDY 5 2.50
	
	      CANDY 5 2.50
	
	      BANANA FRIES 3 20.60
	
	      CANDY 5 2.50
	
	      POTATO CHIPS 5 15.50
	
	      CLOSE
	
	Sample Output: {'BANANA FRIES': 103.0, 'POTATO CHIPS': 124.0, 'APPLE JUICE': 1612.0, 'CAND Y': 50.0}

14.	Write a function to make use of variable length arguments.
15.	Write a Recursive function to generate ith term of a Fibonacci Series 0,1,1,2,3,5,8,13,... Generate n terms of Fibonacci Series using this recursive function.

Text Books:
1. E. Balagurusamy, *Introduction to Computing and Problem Solving Using Python*, McGrawHill Education
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Course Code	Course Title	L	T	P	Credits
BCA-258A	**Java Programming** (Pre-requisite: None)	3	0	0	3
		CIE	SEE	Total	
		40	60	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-258A.1	Understand fundamental concepts of Java programming.
BCA-258A.2	Apply object-oriented principles like classes, inheritance, and interfaces in Java.
BCA-258A.3	Implement and manage Java packages and handle exceptions effectively.
BCA-258A.4	Demonstrate file I/O operations and implement multithreading in Java.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-258A.1	3	2	2	2	-	-	-	2	-	-
BCA-258A.2	3	2	2	3	2	-	-	2	-	2
BCA-258A.3	3	2	2	3	2	2	-	3	2	3
BCA-258A.4	3	2	2	3	2	2	-	2	2	3

Course Contents:

<div align="center">

UNIT-I Contact Hours: 12

</div>

Fundamentals of Java

Introduction to Java: Java Features, Java Virtual Machine and bytecode, Basics of Java programming: syntax, variables data types, operators and expressions, statements

Control Flow: Decision-making statements (if, else-if, switch). looping statements (for, while, do-while) and branching statements (break, continue, return),

Arrays: Declaring, initializing and manipulating arrays, array operations

<div align="center">

UNIT-II Contact Hours: 12

</div>

Object oriented programming concepts of Java

Classes and Objects: Declaring Classes and creating Objects, constructors, Garbage Collection, finalize() Method, Access modifiers (public, private, protected, default), static and final modifier, 'this' keyword, Method overloading, Wrapper Classes.

Inheritance: Extending classes, Method Overriding, 'super' keyword, Abstract classes, Multiple Inheritance, Interfaces and Extending Interfaces

<div align="center">

UNIT-III Contact Hours: 11

</div>

Working with Packages and handling Exceptions

Packages: Java API Packages, importing packages, creating a new packages and using classes from package

Exception Handling: Types of Errors, Understanding Exceptions, Built-in Exceptions, checked and unchecked exceptions, try-catch block, multiple catch clauses, nested try block, finally block, throw and throws keywords, user created exceptions.

<div align="center">

UNIT-IV Contact Hours: 10

</div>

Input output streams and multithreading

Java I/O Streams: Character and Byte streams, Reading console Input using java.util.Scanner and Writing console Output, Reading from and writing to files using FileInputStream, and FileOutputStream, FileReader and FileWriter. Object serialization and de-serialization.

Multithreading: Process versus Threads, Creating threads using Thread class and Runnable interface, thread lifecycle methods, Thread Priorities.

Bachelor of Computer Applications (CTIS): Approved in 2ⁿᵈ meeting of Academic Council held on 28.06.2025.

Text Books:
1. Patrick Naughton, Herbert, Schild, *The Complete reference Java 2*, Tata Mc-Graw Hill.
2. E. Balaguruswamy *Programming with JAVA- A Primer*, Tata Mc-Graw Hill publication

Reference Books:
1. Nell Dale, Chip Weems, *Programming and Problem Solving with Java,* Jones and Bartlett Publishers
2. Harvey Deitel, Paul Deitel, *Java: How to Program*, Pearson

NOTE:
1. For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 5-7 short answer type questions, will be compulsory and based on the entire syllabus. Rest of the eight questions is to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit AND Question no. 1. All questions will carry equal marks.

2. The students will be allowed to use non-programmable scientific calculator. However, sharing / ex-change of calculator or any other items are prohibited in the examinations. No programmable calculators, mobile phones or other electrical/ electronic items are allowed in the examination.

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Course Code	Course Title	L	T	P	Credits
BCA-288A	**Java Programming Lab** (Pre-requisite: Java)	0	0	4	2
		CIE	SEE	Total	
		50	50	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-288A.1	Apply Java basics, control structures, and array manipulation.
BCA-288A.2	Apply object-oriented principles like classes, inheritance, and interfaces in Java.
BCA-288A.3	Implement and manage Java packages and handle exceptions effectively.
BCA-288A.4	Perform file I/O operations and implement multithreading in Java.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-288A.1	3	2	2	2	-	-	-	2	-	-
BCA-288A.2	3	2	2	3	2	-	-	2	-	2
BCA-288A.3	3	2	2	3	2	2	-	3	2	3
BCA-288A.4	3	2	2	3	2	2	-	2	2	3

List of Experiments	
No.	**Experiment Detail**
1.	Write a Java program that converts temperatures between Celsius and Fahrenheit based on user input.
2.	Implement a Java program to perform matrix multiplication using arrays.
3.	Write Java program to find the largest and smallest elements in an array.
4.	Implement a Java Program to sort an array of integers using Bubble sort.
5.	Write a program to implement method overloading.
6.	Develop a Java program to implement inheritance by creating a base class Animal and derived classes like Dog and Cat.
7.	Write a Java program to demonstrate method overriding by implementing a base class Shape, and derived classes Circle and Rectangle.
8.	Write a program to handle exceptions using try-catch.
9.	Write a program to demonstrate the use of 'throws' keyword.
10.	Write a program to handle user defined exceptions.
11.	Write a program to perform read and write operations on files using FileInputStream and FileOutputStream.
12.	Write a program to perform read and write operations on files using FileReader and FileWriter.
13.	Write a program to create and run multiple threads.
14.	Write a program to implement thread life-cycle methods.
15.	Write a program to implement thread priorities.

Text Books:
1. Patrick Naughton, Herbert, Schild, *The Complete reference Java 2*, Tata Mc-Graw Hill.
2. E. Balaguruswamy *Programming with JAVA- A Primer*, Tata Mc-Graw Hill publication

Bachelor of Computer Applications (CTIS): Approved in 2nd meeting of Academic Council held on 28.06.2025.

Reference Books:

1. Nell Dale, Chip Weems, *Programming and Problem Solving with Java,* Jones and Bartlett Publishers

2. Harvey Deitel, Paul Deitel, *Java: How to Program*, Pearson

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Course Code	Course Title	L	T	P	Credits
BCA-377A	**Industrial Internship** (Pre-requisite: None)	0	0	0	4
		CIE	SEE	Total	
		100	-	100	

Course Outcomes (COs): At the end of this course, students will be able to

BCA-377A.1	Examine and evaluate problems given by industry.
BCA-377A.2	Learn professional skills such as teamwork, communication, and project management in an industry setting.
BCA-377A.3	Employ industry-standard tools and technologies to successfully complete assigned tasks and projects.
BCA-377A.4	Develop comprehensive documentation summarizing project outcomes, and detailing the skills acquired during the internship.

Course Outcomes (CO) to Program Outcomes (PO) mapping (scale 1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
BCA-377A.1	2	3	-	–	–	-	–	–	2	-
BCA-377A.2	2	–	–	3	3	3	2	3	3	2
BCA-377A.3	3	3	3	3	3	2	-	2	3	3
BCA-377A.4	2	–	3	3	3	-	2	3	-	-

Guidelines for Industrial Training/ Internship: This course requires students to participate in professional employment-related activity or work experience or co-operative education activity with an entity external to the educational institution, normally under the supervision of an employee of an organization or an individual professional. A key aspect of the internship is induction into actual, formal, and organized work situation. Internship involves working with government or private industry, training or high-end educational organizations (such as IITs, etc.), business establishments, etc. to provide opportunities for students to actively engage in on-site experiential learning.

l) The candidate shall be required to undergo industrial trainings /internships of the specified duration, provided in the Scheme of Studies and Examinations, in an industry/ business enterprise/ organization approved by the Head of the Department.

m) If the concerned Department perceives any limitations from the industry to accommodate all the enrolled students, a student may be permitted to complete a skill-oriented e-content course (of sufficient duration) relevant to the industry or undertake a project-based / research project under the supervision of a faculty of a premier Institute (such as I.I.T., I.I.Sc.) with prior approval from the competent authority.

n) The Training will be completed under the supervision of the officer (herein called Co. Training Supervisor) of the Company/ Organization under whose guidance and supervision the training was allotted to the candidate.

o) A student can do industrial training/internship of 45-60 days duration during summer vacation after the 2nd or 4th semester before taking an exit or completing the degree programme in the respective discipline. It will be of 4 credits.

p) If a student pursues 3 years UG Programme in respective discipline without taking Exit option, this internship (either done after 2nd or 4th semester) will be taken into account in 5th semester.

q) If a student takes Exit after 2 years in UG Programme, this internship (either done after 2nd or 4th semester) will be taken into account in 4th semester.

r) If a student takes Exit after 1 year in UG Programme, the mandatory internship done after 2nd semester will be taken into account in 2nd semester.

s) However, for those students who have taken lateral entry into the 3rd semester and have completed internship of 45-60 days duration during first year, the internship is not required after the 4th semester.

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t) The candidates are required to submit a comprehensive report Training Supervisor within two weeks of completion of the training along with Co. Training Supervisor's Certificate in the beginning of the report stating that the report is an outcome of the work done by the candidate during his/her training.

u) The viva-voce shall be held by Internal Examiner within two weeks after submission of the report.

v) The Industrial Training/ Internship has only CIE component of 100 marks that shall be conducted as given in Table-1.

Table-1: Relative Weightages of Industrial Training/ Internship

Component	Description of the Component		Relative Weightage (Out of 100)
CIE	i)	Internship Synopsis Evaluation within 10 days of start of Internship	20
	ii)	Mid-Term Internship Evaluation	30
	iii)	Final Presentation and Internship Evaluation	50
		CIE Total	**100**
SEE	NIL		NIL
		Grand Total	**100**